ABBEYCONSULTANTS

Energy Statement

Report to Discharge Condition 33 of Planning Permission Ref: 221324

97a - 117 Caversham Road

Bellway Homes, Thames Valley

Report No: DC-ES-BWTV-CR-26-01

Report Date: May 2026

ABBEYCONSULTANTS

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1. ASSESSMENT INFORMATION

Project Name	Carters, Reading
Project Address	97a - 117 Caversham Road
Developer	Bellway Homes, Thames Valley
Developer Address	Imperium, Imperium Way Reading Berkshire RG2 0TD
Architect	HGP Architects Ltd
Architect's Address	Fursehall Farm, Wickham Road, Fareham, Hampshire PO16 7JH
Project Description	Redevelopment of 97a-117 Caversham Road and associated land to the rear to provide 60 dwellings, including affordable housing together with associated access paring and landscaping.

	Author	Date	Email Address
Produced by	MH	01/05/26	Matt.fitzpatrick@abbey-consultants.com
Reviewed by			

Issue Number	Author	Date	Reason
01	MH	01/05/26	Initial Issue
02			
03			

This document has been prepared for Bellway Homes, Thames Valley only and solely for the purposes expressly defined herein. We owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.

2. EXECUTIVE SUMMARY

Abbey Consultants (Southern) Ltd have prepared this report on behalf of Bellway Homes Thames Valley to support the discharging of Reading Borough Council's condition 33 of the planning application (ref: 221324) for the development at 97a - 117 Caversham Road.

Planning permission (ref: 221324) for the development was granted by Reading Borough Council on 5th September 2023 subject to several conditions. This report responds solely to condition 33 which has been reproduced below for reference:

> *33.* The development hereby permitted shall not be occupied until written verification has been submitted *to and approved in writing by the Local Planning Authority demonstrating that all of the dwellings hereby permitted will achieve a minimum of a 35% improvement in the dwelling emission rate over the target emission rate, as defined in The Building Regulations for England Approved Document L1A: Conservation of Fuel and Power in New Dwellings (2013 edition) and a S106 contribution has been made to the Local Authority to account for any remaining emissions, such evidence will be in the form of an 'As Built' Standard Assessment Procedure (SAP) assessment, produced by an accredited energy assessor.*
>
> *REASON: To ensure that the development is carried out in accordance with sustainable building standards in accordance with Policy CC2 and H5 of the Reading Borough Local Plan 2019.*

In keeping with the requirements of condition 33, this report comprises of the following:

- A Building Regulation baseline energy assessment for the proposed development.
- Energy conservation measures to be undertaken in the design of the development.
- A calculation of CO_2 savings that are to be achieved as a result of energy efficiency measures.

The proposed site is to be built to Part L1 2021 of the Building Regulations, therefore SAP 10.2 methodology has been used for the energy assessment detailed within this report.

Planning condition 33 requires a minimum 35% improvement in Dwelling Emission Rate (DER) over the Target Emission Rate (TER) in accordance with Approved Document Part L1A 2013.

The development has been assessed in accordance with Approved Document Part L1 2021, which represents an approximate 31% improvement in carbon emission standards over the 2013 edition. The submitted 'As Built' SAP calculations confirm that the dwellings achieve a 48% improvement in DER over the TER under Part L 2021.

Given the increased stringency of Part L 2021, this level of performance significantly exceeds the intent of the planning condition. The requirement for a 35% improvement over Part L 2013 is therefore demonstrably met.

Table 1: Total CO_2 Savings: Compared against Part L1 2021 Baseline

Element	'As Built' SAP calculations (kg/CO_2/year)
Part L1 2021 Baseline	61.47
After Energy Hierarchy	31.83
Saving	**29.64**
Improvement	**48%**

In addition to the above, planning condition 33 requires the development to make a S106 contribution to the Local Authority to account for any remaining emissions.

The table above demonstrates that after all elements of the energy hierarchy have been accounted for, there is a carbon shortfall of 31.83 tonnes per year. This figure will therefore be used in calculating the required S106 contribution.

The calculation of the total S106 contribution is detailed below, has been calculated in accordance with the guidance detailed within the Council's Design and Construction Supplementary Planning Document (2019). The Council's S106 contribution is currently calculated at £60 per tonne over a 30-year lifetime of the development.

As detailed within the below table, the total proposed carbon offset payment will be £57,294.

Table 2: Calculation of S106 Contribution

Item	Details
Rate of carbon offset payment	£60 per tonne
Residual carbon for offset payment	31.83 tonnes per year
Timescale for carbon abatement	30 years
Total calculated carbon offset payment	**£60 x 31.83 tonnes x 30 years = £57,294**

A previous Energy & Sustainability Statement, prepared by AES and dated August 2022, forms part of the approved documentation for the planning permission that granted this development (ref: 221324). The AES report initially calculated the S106 contribution to be £48,419. This sum has previously been paid by Bellway Homes Thames Valley to Reading Borough Council. Therefore, this can be deducted from the total amount calculated in Table 2, which leaves a balance of £8,875 to be paid to the Council.

Energy Strategy Summary

The strategy achieves and meets the following requirements:

- Includes improved optimal building fabric improvements, energy efficient design of building services.
- Following the measures detailed within the energy hierarchy the proposed development will reduce carbon emissions by 69% when compared with Part L 2021 Building Regulations.
- In keeping with the requirements of Condition 33 the savings are in excess of 35% of a Part L1A 2013 baseline.
- S106 contribution of £57,294 to be made to account for the remaining emissions.

3. INTRODUCTION

This document has been prepared by Abbey Consultants (Southern) Ltd, a specialist environmental and independent energy consultancy on behalf of Bellway Homes, Thames Valley.

The following report establishes a baseline assessment of the energy demands and associated CO_2 emissions for the development. The energy hierarchy approach of Be Lean, Be Clean and Be Green is then followed to ensure the maximum viable reductions in energy and regulated CO_2 emissions is achieved.

The report takes into consideration the layout, use and requirements for the development and follows the strategy recommended in the Energy Strategy submitted to support the planning application. It shows that the requirements of Condition 33 of planning permission ref: 221324 have been met.

Figure 1: Site Plan



4. Planning Condition

The following report sets out the intentions of Bellway Homes, Thames Valley, with regards to energy, in order to discharge Reading Borough Council's condition 33 of planning permission ref: 221324.

The condition reads as below:

Condition 33

The development hereby permitted shall not be occupied until written verification has been submitted to and approved in writing by the Local Planning Authority demonstrating that all of the dwellings hereby permitted will achieve a minimum of a 35% improvement in the dwelling emission rate over the target emission rate, as defined in The Building Regulations for England Approved Document L1A: Conservation of Fuel and Power in New Dwellings (2013 edition) and a S106 contribution has been made to the Local Authority to account for any remaining emissions, such evidence will be in the form of an 'As Built' Standard Assessment Procedure (SAP) assessment, produced by an accredited energy assessor.

REASON: To ensure that the development is carried out in accordance with sustainable building standards in accordance with Policy CC2 and H5 of the Reading Borough Local Plan 2019.

5. Development Approach

The proposed energy strategy follows the established and widely accepted Energy Hierarchy of eliminate energy need (Be Lean), Use energy efficiently (Be Clean) and supply energy from renewable and low carbon sources (Be Green) to enable the maximum viable reductions in regulated and total CO_2 emissions over the baseline.

The proposed energy supply solutions aim to match energy profiles of the development ensuring effective use. The proposed solutions consider viability and flexibility of the scheme from both a technical and economic point of view by identifying best combination of energy efficiency measures as well as decentralised and renewable energy supply solutions.

Using these principles, Bellway Homes, Thames Valley will deliver the following objectives:

- Comply with the relevant regulatory requirements.
- Ensure that a reduction in CO_2 beyond Part L 2021 standards is achieved across the site through fabric and energy efficiency measures.
- To propose to reduce energy consumption and carbon dioxide emissions further through the use of on-site renewable or low and zero carbon technologies (LZC).

5.1 Carbon Conversion Factors

The report has been prepared using SAP 10.2 Building Regulation carbon conversion factors as detailed in the table below.

Table 3: Carbon conversion factors

Fuel Type	SAP 10.2 CO_2 Conversion Factors (kg/kWh)
Natural Gas	0.210
Grid Electricity	0.136

6. Energy Calculations

A baseline total energy demand has been established for the proposed development. Reductions in demand due to energy conservation measures are considered and form the basis of the energy strategy which follows.

Floor plans for the development have been used in conjunction with building specifications to prepare the 'As Built' SAP calculations to all units.

The 'As Built' SAP calculations have been carried out to Approved Document Part L1 2021. The relevant energy loads and associated CO_2 demand have been collated from the 'As Built' SAP calculation sheets, which can be found in the appendices.

Regulated Energy Demand is calculated from the energy associated with space heating, hot water and fixed electrical demands (for lights, fans and pumps).

Unregulated energy is the annual electrical energy demand from appliances. These are variable dependent on occupancy usage patterns and requirements. Therefore, they are not included within the main assessment of this energy strategy.

Energy savings are measured in terms of a reduction in CO_2 emissions and kWh, which are calculated from their association with a particular fuel source. CO_2 Conversion Factors have been taken from Table 12 of the SAP 10.2 methodology, which should be used for demonstrating compliance with Building Regulations Part L1 2021.

7. Passive Design and Energy Efficient Measures

In accordance with the Energy Hierarchy, the energy demands of the development should be reduced as much as practically viable. The desire is to achieve Part L1 2021 Building Regulations compliance before low carbon or renewable measures are introduced.

A range of measures to reduce CO_2 emissions and increase resilience to climate change are proposed in the building design including good building fabric standards as well as energy efficient M&E systems and lighting.

7.1 Passive design

'Passive design' is design that takes advantage of the climate to maintain a comfortable temperature range in the home. Passive design reduces or eliminates the need for auxiliary heating or cooling in the home. The importance of passive design cannot be overstated. Paying attention to the principles of good passive design suitable for the climate effectively 'locks in' thermal comfort, low heating and cooling bills, and reduced greenhouse gas emissions for the life span of the home.

The development incorporates a range of passive design measures and an energy efficient building fabric that reduces the demand for space heating, ventilation, and artificial lighting and negate the need for cooling.

Passive design utilises natural sources of heating and cooling, such as the sun and cooling breezes and consideration has been achieved by appropriately orientating the dwellings on the development and ensuring the specification of the building envelope is suitably robust. A well-designed building envelope minimises unwanted heat gain and loss.

Natural ventilation is considered the most appropriate method in this instance. The ventilation strategy has been reviewed to ensure compliance with all the relevant regulations and standards.

The proposed glazed areas have been designed to maximise daylight and optimise solar gains. The glazing specification has been reviewed to ensure that it provides an appropriate balance between solar control and solar gain.

7.2 BUILDING FABRIC

To reduce demand for space heating, emphasis has been placed on providing a very high standard of fabric efficiency and reducing heat loss through the building envelope. Approved Document Part L1 2021 sets out the limiting fabric parameters for each of the building elements. Each stated value represents the area-weighted average U-value. The following table details the as-built U-values in the described exposed element within the fabric of the development.

Table 4: 'As Built' Specification

Element	Maximum Allowable SAP 10.2	'As Built' Specification
Ground Floor	0.18 W/m^{2}K	0.12 W/m^{2}K
Exposed Floor	0.18 W/m^{2}K	0.12 W/m^{2}K
External Walls (houses)	0.26 W/m^{2}K	0.25 W/m^{2}K
External Walls (apartments)	0.26 W/m^{2}K	0.21 W/m^{2}K
Communal Walls	0.26 W/m^{2}K	0.25 W/m^{2}K
Party Wall	0.20 W/m^{2}K	0.00 W/m^{2}K
Roof – cold roof	0.16 W/m^{2}K	0.09 W/m^{2}K
Roof – flat	0.16 W/m^{2}K	0.12-0.13 W/m^{2}K
Windows	1.60 W/m^{2}K	Blocks A & B: 1.0 W/m^{2}K - G – 0.32 Block C: 1.2 W/m^{2}K - G – 0.44 Houses: 1.20 W/m^{2}K - G – 0.44
Doors	1.60 W/m^{2}K	1.20 W/m^{2}K

To further minimise heat loss through the building envelope, air leakage will be made a priority. The airtightness of the dwellings were set between levels of 2.00-4.50m^3/h/m^2. Such levels of airtightness, along with the proposed enhanced fabric measures, will increase comfort and warmth as well as save future residents money on energy bills.

Repeated thermal bridges such as timber studs or mortar joints are already covered by U-value calculations. Non-repeating thermal bridges are intermittent and occur at specific points in the construction. They are often caused by discontinuities in the thermal envelope. They commonly occur around openings and other instances where materials of different thermal conductivities form part of the external envelope.

Accredited construction details for all wall junctions will be specified to minimise the effects of non-repeating thermal bridging and reduce heat loss further. By specifying and ensuring that ACDs are designed into the build, CO_2 emissions can be reduced by up to 5%.

7.3 FABRIC ENERGY EFFICIENCY (FEE)

Using the specification detailed, the overall Part L (2021) Fabric Energy Efficiency (FEE) performance has been reviewed for and compared to the baseline stage of the energy hierarchy. The enhanced building fabric proposed by Bellway Homes, Thames Valley has improved upon Building Regulations by 3%. The results are shown in the following table.

Table 5: Residential FEE Performance

Element	Target Fabric Energy Efficiency (TFEE) kWh/m²/year	Dwelling Fabric Energy Efficiency (DFEE) kWh/m²/year	Improvement (%)
Development Total	38.17	36.87	3%

7.4 Building Services Energy Efficiency Measures

The building services and systems that have been employed within the dwellings are summarised in the following table.

Table 6: Summary of Building Services

Building Service Element	Specification Apartments	Specification Houses
Heating:	Electric	Gas Boiler Ideal Logic Code Combi 38 ESP1
Heating Emitter:	Electric Panel Heaters	Radiators
Heating Controls:	Programmer and Room Thermostat	Time and Temperature Zone Delayed Start Stat No Weather Compensation
Hot Water:	Vaillant aroSTOR 200 ltr Heat Pump	From Boiler
Cylinder: Heat Loss:	200 litre cylinder 1.22 kWh/24 Hr	Not applicable as combi used
Waste Water Heat Recovery:	None	Shower Save QB1-21
Flue Gas Heat Recovery:	None	None
Showers:	Fed from heat pump	From Boiler
Ventilation:	Block A & B: MVHR (Titon HRV4.25Q Plus) Block C: Centralised MEV (Titon CME2.1 Q Plus MEV)	Decentralised MEV (Titon Ultimate)

8. RENEWABLES OR LZC TECHNOLOGY

As the houses are to be heated using Gas Boilers there is a requirement to include PV on the roof to ensure compliance with Part L1A 2021.

The following amount of PV has been included per house type.

Table 7: PV Quantity

House Type	Amount of PV (kWp)
End Terrace/Semi Detached	2.68
Mid Terrace	1.67
Plot 54	2.43

9. RESULTS & CONCLUSIONS

The energy strategy detailed within this report has followed the accepted Energy Hierarchy of 'Be Lean', 'Be Clean' and 'Be Green'.

The proposed site is to be built to Part L1 2021 of the Building Regulations, therefore SAP 10.2 methodology has been used for the energy assessment detailed within this report.

Planning condition 33 requires a minimum 35% improvement in Dwelling Emission Rate (DER) over the Target Emission Rate (TER) in accordance with Approved Document Part L1A 2013.

The development has been assessed in accordance with Approved Document Part L1 2021, which represents an approximate 31% improvement in carbon emission standards over the 2013 edition. The submitted 'As Built' SAP calculations confirm that the dwellings achieve a 48% improvement in DER over the TER under Part L 2021.

Given the increased stringency of Part L 2021, this level of performance significantly exceeds the intent of the planning condition. The requirement for a 35% improvement over Part L 2013 is therefore demonstrably met.

The following tables details the total carbon emissions based on the 'As Built' SAP calculations.

Table 8: Summary of Results

Element	'As Built' SAP calculations (tonnes/CO_2/year)
Part L1 2021 Baseline	61.47
After Energy Hierarchy	31.83
Saving	**29.64**
Improvement	**48%**

In addition to the above, planning condition 33 requires the development to make a S106 contribution to the Local Authority to account for any remaining emissions.

The table above demonstrates that after all elements of the energy hierarchy have been accounted for, there is a carbon shortfall of 31.83 tonnes per year. This figure will therefore be used in calculating the required S106 contribution.

The calculation of the total S106 contribution is detailed below, has been calculated in accordance with the guidance detailed within the Council's Design and Construction Supplementary Planning Document (2019). The Council's S106 contribution is currently calculated at £60 per tonne over a 30-year lifetime of the development.

As detailed within the below table, the total proposed carbon offset payment will be £4,347.

Table 9: Calculation of carbon offset payment

Item	Details
Rate of carbon offset payment	£60 per tonne
Residual carbon for offset payment	31.83 tonnes per year
Timescale for carbon abatement	30 years
Total calculated carbon offset payment	**£60 x 31.83 tonnes x 30 years = £57,294**

10. APPENDICES

The following pages detail:

- Appendix A: 'As Built' SAP Output Sheets (SAP 10.2)

Summary for Input Data

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Plot Reference	P-01	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-01
Plot Address	Flat 1, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.87	**TER**	15.66
Environmental	94 A	**% DER < TER**			56.13
CO_2 Emissions (t/year)	0.44	**DFEE**	48.48	**TFEE**	48.82
Compliance Check	See BREL	**% DFEE < TFEE**			0.71
% DPER < TPER	15.01	**DPER**	70.64	**TPER**	83.11

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	327.50	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	42.11 m	78.09 m²	2.55 m

8.0 Living Area	30.81	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	88.27	62.49	0.00	None	25.78	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	17.63	15.48	0.50	Stairwell Access Corridor 1	2.15	Enter Gross Area
Lift Shaft	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	15.10	15.10	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	142.17

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	78.09

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	78.09

12.0 Opening Types

Summary for Input Data

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-GBY	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	South West	2.15	
Patio Door	Patio Door	Brickwork	North East	6.69	
East	Window-GBY	Brickwork	North East	10.65	
North	Window-GBY	Brickwork	North West	2.81	
South	Window-GBY	Brickwork	South East	5.62	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	11.44	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	38.84	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	42.11	0.11	0.11	RCD	No
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	42.11	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	20.65	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	7.95	-0.10	-0.10	RCD	No

Y-value	0.04	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes	
Approved Installation	No	
Mechanical Ventilation data Type	Database	
Type	Balanced mechanical ventilation with heat recovery	
MV Reference Number	500841	
Configuration	3	
Manufacturer SFP	0.54	
Duct Type	Rigid	
MVHR Efficiency	89.00	
Wet Rooms	3	
SFP from Installer Commissioning Certificate	No	
MVHR System Location	Inside heated envelope (installed exclusively)	
Duct Installation Specification	Level 2	

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa

Summary for Input Data

elmhurst energy

Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.95	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	8
Downlight	85.00	10.00	850.00	14

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	

25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	

26.0 Heat Networks	None

27.0 Secondary Heating	None

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L

Summary for Input Data

Loss	1.61	kWh/day

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-01	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-01
Plot Address	Flat 1, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.87	**TER**	15.66
Environmental	94 A	**% DER < TER**			56.13
CO_2 Emissions (t/year)	0.44	**DFEE**	48.48	**TFEE**	48.82
Compliance Check	See BREL	**% DFEE < TFEE**			0.71
% DPER < TPER	15.01	**DPER**	70.64	**TPER**	83.11

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.0900	(1b)	x 2.5500	(2b) =	199.1295	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0900					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	199.1295	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9500	(17)
Infiltration rate		0.1475	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000	(23c)
Effective ac	0.3039	0.3007	0.2976	0.2819	0.2788	0.2631	0.2631	0.2600	0.2694	0.2788	0.2850	0.2913	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.6900	1.1450	7.6603			(27)
Window-GBY			19.0800	1.1450	21.8473			(27)
Ground Floor			78.0900	0.1200	9.3708	110.0000	8589.9000	(28a)
Brickwork	88.2700	25.7700	62.5000	0.2100	13.1250	110.0000	6874.9996	(29a)
Communal Wall	17.6300	2.1500	15.4800	0.2200	3.4056	110.0000	1702.7999	(29a)
Lift Shaft	15.1000		15.1000	0.1600	2.4160	110.0000	1661.0000	(29a)
Total net area of external elements Aum(A, m2)			199.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.4050			(33)
Main dwelling								
Party Ceiling 1			78.0900			30.0000	2342.7000	(32b)
Internal Wall 1			142.1700			9.0000	1279.5300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22450.9296	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							287.5007	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	11.4400	0.0500	0.5720	
E4 Jamb	38.8400	0.0160	0.6214	
E5 Ground floor (normal)	42.1100	0.1120	4.7163	
E7 Party floor between dwellings (in blocks of flats)	42.1100	0.0380	1.6002	
E16 Corner (normal)	20.6500	0.0540	1.1151	
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.8539	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	68.2589	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.9670	19.7611	19.5551	18.5252	18.3193	17.2894	17.2894	17.0835	17.7014	18.3193	18.7312	19.1431	(38)
Heat transfer coeff	88.2259	88.0200	87.8140	86.7842	86.5782	85.5484	85.5484	85.3424	85.9603	86.5782	86.9901	87.4021	(39)
Average = Sum(39)m / 12 =												86.7327	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1298	1.1272	1.1245	1.1113	1.1087	1.0955	1.0955	1.0929	1.1008	1.1087	1.1140	1.1192	(40)
HLP (average)												1.1107	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.4256	(42)
Hot water usage for mixer showers	64.8894	63.9142	62.4932	59.7744	57.7680	55.5304	54.2586	55.6688	57.2147	59.6172	62.3944	64.6408	(42a)
Hot water usage for baths	28.0278	27.6115	27.0254	25.9446	25.1353	24.2379	23.7532	24.3353	24.9690	25.9293	27.0323	27.9330	(42b)
Hot water usage for other uses	39.4708	38.0355	36.6002	35.1649	33.7296	32.2943	32.2943	33.7296	35.1649	36.6002	38.0355	39.4708	(42c)
Average daily hot water use (litres/day)												121.6945	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3880	129.5612	126.1188	120.8838	116.6328	112.0626	110.3061	113.7337	117.3487	122.1466	127.4622	132.0446	(44)
Energy conte	209.6702	184.4935	193.8399	165.4839	157.0102	137.7941	133.4056	140.8261	144.7026	165.7518	181.5933	206.7499	(45)
Energy content (annual)										Total = Sum(45)m =		2021.3211	
Distribution loss (46)m = 0.15 x (45)m	31.4505	27.6740	29.0760	24.8226	23.5515	20.6691	20.0108	21.1239	21.7054	24.8628	27.2390	31.0125	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)
										Total per year (kWh/year) = Sum(64)m =		2338.6521	(64)
12Total per year (kWh/year)												2339	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.7153	61.3441	64.4518	55.0234	52.2059	45.8165	44.3574	46.8247	48.1136	55.1125	60.3798	68.7443	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.6458	120.2864	108.6458	112.2673	108.6458	112.2673	108.6458	108.6458	112.2673	108.6458	112.2673	108.6458	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4024	217.6376	212.0049	200.0137	184.8770	170.6505	161.1464	158.9112	164.5438	176.5351	191.6718	205.8982	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	(71)
Water heating gains (Table 5)	93.7034	91.2858	86.6287	76.4214	70.1692	63.6341	59.6201	62.9364	66.8245	74.0759	83.8608	92.3983	(72)
Total internal gains	477.1358	488.5941	466.6637	448.0867	423.0762	405.9362	388.7966	389.8777	403.0199	418.6411	447.1842	466.3266	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6900	11.2829	0.3300	0.0000	0.7700	19.1802	(75)
Northeast	10.6500	11.2829	0.3300	0.0000	0.7700	30.5335	(75)
Southeast	5.6200	36.7938	0.3300	0.0000	0.7700	52.5431	(77)
Northwest	2.8100	11.2829	0.3300	0.0000	0.7700	8.0563	(81)

Solar gains	110.3131	207.0928	334.3225	499.6736	637.6543	667.3432	629.1159	520.9323	390.7563	242.6243	135.6241	92.1438	(83)

Total gains	587.4489	695.6869	800.9862	947.7603	1060.7306	1073.2793	1017.9125	910.8099	793.7762	661.2653	582.8083	558.4705	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6863	70.8518	71.0179	71.8607	72.0316	72.8988	72.8988	73.0747	72.5494	72.0316	71.6905	71.3527	
alpha	5.7124	5.7235	5.7345	5.7907	5.8021	5.8599	5.8599	5.8716	5.8366	5.8021	5.7794	5.7568	
util living area													
	0.9968	0.9913	0.9728	0.8927	0.7154	0.5052	0.3691	0.4293	0.7073	0.9495	0.9923	0.9976	(86)
MIT	19.9069	20.1038	20.3911	20.7480	20.9428	20.9935	20.9991	20.9980	20.9608	20.6633	20.2213	19.8761	(87)
Th 2	19.9766	19.9787	19.9809	19.9916	19.9937	20.0045	20.0045	20.0067	20.0002	19.9937	19.9894	19.9851	(88)
util rest of house													
	0.9957	0.9880	0.9629	0.8593	0.6525	0.4290	0.2860	0.3376	0.6212	0.9255	0.9889	0.9967	(89)
MIT 2	18.7155	18.9673	19.3285	19.7567	19.9526	20.0015	20.0043	20.0061	19.9779	19.6746	19.1263	18.6826	(90)
Living area fraction										fLA = Living area / (4) =		0.3945	(91)
MIT	19.1856	19.4157	19.7478	20.1479	20.3433	20.3929	20.3968	20.3975	20.3657	20.0647	19.5583	19.1535	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1856	19.4157	19.7478	20.1479	20.3433	20.3929	20.3968	20.3975	20.3657	20.0647	19.5583	19.1535	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9857	0.9601	0.8650	0.6752	0.4590	0.3188	0.3738	0.6541	0.9275	0.9870	0.9957	(94)
Useful gains	584.1563	685.7505	769.0507	819.8284	716.2155	492.6765	324.5358	340.4835	519.2303	613.3456	575.2238	556.0688	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1313.2932	1277.6754	1163.3388	976.1353	748.3203	495.5715	324.8099	341.1526	538.5992	819.4357	1083.7504	1306.9665	(97)
Space heating kWh													
	542.4779	397.7736	293.3503	112.5410	23.8859	0.0000	0.0000	0.0000	0.0000	153.3311	366.1391	558.6679	(98a)
Space heating requirement - total per year (kWh/year)												2448.1668	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	542.4779	397.7736	293.3503	112.5410	23.8859	0.0000	0.0000	0.0000	0.0000	153.3311	366.1391	558.6679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2448.1668	
Space heating per m2											(98c) / (4) =	31.3506	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	542.4779	397.7736	293.3503	112.5410	23.8859	0.0000	0.0000	0.0000	0.0000	153.3311	366.1391	558.6679	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	542.4779	397.7736	293.3503	112.5410	23.8859	0.0000	0.0000	0.0000	0.0000	153.3311	366.1391	558.6679	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	72.9143	64.3525	68.0363	59.0306	56.6873	50.4980	49.4136	51.7002	52.6268	59.3810	63.9946	72.0145	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.5986	14.0891	15.5986	15.0954	15.5986	15.0954	15.5986	15.5986	15.0954	15.5986	15.0954	15.5986	(231)
Lighting	22.1130	17.7399	15.9728	11.7024	9.0392	7.3851	8.2459	10.7183	13.9221	18.2665	20.6320	22.7276	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2448.1668	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												720.6496	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	183.6611	(230a)
Total electricity for the above, kWh/year	183.6611	(231)
Electricity for lighting (calculated in Appendix L)	178.4648	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3530.9423	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2448.1668	0.1566	383.3995	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	720.6496	0.1412	101.7480	(264)
Space and water heating			485.1475	(265)
Pumps, fans and electric keep-hot	183.6611	0.1387	25.4761	(267)
Energy for lighting	178.4648	0.1443	25.7580	(268)
Total CO2, kg/year			536.3815	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.8700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2448.1668	1.5798	3867.5403	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	720.6496	1.5221	1096.8871	(278)
Space and water heating			4964.4274	(279)
Pumps, fans and electric keep-hot	183.6611	1.5128	277.8425	(281)
Energy for lighting	178.4648	1.5338	273.7353	(282)
Total Primary energy kWh/year			5516.0052	(286)
Dwelling Primary energy Rate (DPER)			70.6400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.0900	(1b) x	2.5500	(2b) =	199.1295	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		199.1295	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1507	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4007	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3406	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4342	0.4257	0.4172	0.3746	0.3661	0.3235	0.3235	0.3150	0.3406	0.3661	0.3831	0.4002	(22b)
Effective ac	0.5943	0.5906	0.5870	0.5702	0.5670	0.5523	0.5523	0.5496	0.5580	0.5670	0.5734	0.5801	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			17.3800	1.1450	19.9008			(27)
Ground Floor			78.0900	0.1300	10.1517			(28a)
Brickwork	88.2700	17.3800	70.8900	0.1800	12.7602			(29a)
Communal Wall	17.6300	2.1500	15.4800	0.1800	2.7864			(29a)
Lift Shaft	15.1000		15.1000	0.1800	2.7180			(29a)
Total net area of external elements Aum(A, m2)			199.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.4671			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.5007	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4400	0.0500	0.5720
E4 Jamb	38.8400	0.0500	1.9420
E5 Ground floor (normal)	42.1100	0.1600	6.7376
E7 Party floor between dwellings (in blocks of flats)	42.1100	0.0700	2.9477
E16 Corner (normal)	20.6500	0.0900	1.8585
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0900	-0.7155

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.3423	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	63.8094	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.0511	38.8105	38.5747	37.4673	37.2601	36.2955	36.2955	36.1169	36.6670	37.2601	37.6792	38.1175	(38)
Heat transfer coeff	102.8604	102.6199	102.3841	101.2766	101.0694	100.1048	100.1048	99.9262	100.4764	101.0694	101.4886	101.9268	(39)
Average = Sum(39)m / 12 =												101.2756	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3172	1.3141	1.3111	1.2969	1.2943	1.2819	1.2819	1.2796	1.2867	1.2943	1.2996	1.3052	(40)
HLP (average)												1.2969	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4256	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	64.8894	63.9142	62.4932	59.7744	57.7680	55.5304	54.2586	55.6688	57.2147	59.6172	62.3944	64.6408	(42a)
Hot water usage for baths	28.0278	27.6115	27.0254	25.9446	25.1353	24.2379	23.7532	24.3353	24.9690	25.9293	27.0323	27.9330	(42b)
Hot water usage for other uses	39.4708	38.0355	36.6002	35.1649	33.7296	32.2943	32.2943	33.7296	35.1649	36.6002	38.0355	39.4708	(42c)
Average daily hot water use (litres/day)												121.6945	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3880	129.5612	126.1188	120.8838	116.6328	112.0626	110.3061	113.7337	117.3487	122.1466	127.4622	132.0446	(44)
Energy conte	209.6702	184.4935	193.8399	165.4839	157.0102	137.7941	133.4056	140.8261	144.7026	165.7518	181.5933	206.7499	(45)
Energy content (annual)										Total = Sum(45)m =		2021.3211	
Distribution loss (46)m = 0.15 x (45)m	31.4505	27.6740	29.0760	24.8226	23.5515	20.6691	20.0108	21.1239	21.7054	24.8628	27.2390	31.0125	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.2651	226.5792	240.4348	210.5758	203.6051	182.8859	180.0005	187.4210	189.7945	212.3467	226.6851	253.3448	(62)
WWHRS	-29.6647	-26.2357	-27.4725	-22.7483	-21.2006	-18.1415	-17.0048	-18.0829	-18.7699	-22.1277	-25.0680	-29.1154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	226.6003	200.3435	212.9622	187.8274	182.4045	164.7444	162.9957	169.3381	171.0245	190.2190	201.6171	224.2294	(64)
										Total per year (kWh/year) = Sum(64)m =		2294.3063	(64)
12Total per year (kWh/year)												2294	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	106.9913	95.0127	101.7277	91.0969	89.4818	81.8900	81.6333	84.1006	84.1871	92.3884	96.4532	106.0203	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.6497	120.2907	108.6497	112.2713	108.6497	112.2713	108.6497	108.6497	112.2713	108.6497	112.2713	108.6497	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4024	217.6376	212.0049	200.0137	184.8770	170.6505	161.1464	158.9112	164.5438	176.5351	191.6718	205.8982	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	(71)
Water heating gains (Table 5)	143.8054	141.3879	136.7307	126.5235	120.2713	113.7361	109.7222	113.0384	116.9265	124.1780	133.9628	142.5004	(72)
Total internal gains	530.2418	541.7005	519.7697	501.1928	476.1822	456.0423	438.9026	439.9836	453.1260	471.7470	500.2903	519.4326	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.7000	11.2829	0.6300	0.7000	0.7700	40.3441	(75)
Southeast	3.7900	36.7938	0.6300	0.7000	0.7700	42.6173	(77)
Northwest	1.8900	11.2829	0.6300	0.7000	0.7700	6.5171	(81)

Solar gains	89.4785	167.9804	271.1827	405.3082	517.2325	541.3153	510.3070	422.5528	316.9592	196.8017	110.0093	74.7408	(83)
Total gains	619.7203	709.6809	790.9524	906.5010	993.4147	997.3576	949.2095	862.5364	770.0853	668.5487	610.2996	594.1734	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.6294	60.7715	60.9115	61.5776	61.7038	62.2984	62.2984	62.4097	62.0680	61.7038	61.4490	61.1848	
alpha	5.0420	5.0514	5.0608	5.1052	5.1136	5.1532	5.1532	5.1606	5.1379	5.1136	5.0966	5.0790	
util living area	0.9962	0.9920	0.9803	0.9336	0.8124	0.6172	0.4592	0.5230	0.7902	0.9616	0.9920	0.9970	(86)
MIT	19.6854	19.8666	20.1519	20.5456	20.8407	20.9699	20.9945	20.9898	20.8982	20.5105	20.0353	19.6594	(87)
Th 2	19.8274	19.8298	19.8321	19.8432	19.8453	19.8550	19.8550	19.8568	19.8513	19.8453	19.8411	19.8367	(88)
util rest of house	0.9948	0.9889	0.9724	0.9077	0.7492	0.5180	0.3424	0.3983	0.6987	0.9410	0.9884	0.9958	(89)
MIT 2	18.3240	18.5563	18.9178	19.4042	19.7238	19.8406	19.8537	19.8540	19.7899	19.3756	18.7806	18.2976	(90)
Living area fraction										fLA = Living area / (4) =		0.3945	(91)
MIT	18.8612	19.0733	19.4047	19.8545	20.1645	20.2861	20.3038	20.3021	20.2272	19.8234	19.2756	18.8349	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8612	19.0733	19.4047	19.8545	20.1645	20.2861	20.3038	20.3021	20.2272	19.8234	19.2756	18.8349	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9862	0.9687	0.9080	0.7682	0.5567	0.3887	0.4479	0.7315	0.9405	0.9859	0.9944	(94)
Useful gains	615.4541	699.8669	766.1890	823.0803	763.1652	555.1878	368.9840	386.3440	563.2975	628.7962	601.7037	590.8276	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1497.7672	1454.4626	1321.2355	1109.4373	855.4980	569.2093	370.7684	389.9215	615.6390	932.2005	1235.6868	1491.6862	(97)
Space heating kWh	656.4410	507.0883	412.9546	206.1770	68.6956	0.0000	0.0000	0.0000	0.0000	225.7328	456.4679	670.2388	(98a)
Space heating requirement - total per year (kWh/year)												3203.7959	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	656.4410	507.0883	412.9546	206.1770	68.6956	0.0000	0.0000	0.0000	0.0000	225.7328	456.4679	670.2388	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3203.7959	
Space heating per m2											(98c) / (4) =	41.0270	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	656.4410	507.0883	412.9546	206.1770	68.6956	0.0000	0.0000	0.0000	0.0000	225.7328	456.4679	670.2388	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	711.2037	549.3915	447.4048	223.3770	74.4264	0.0000	0.0000	0.0000	0.0000	244.5642	494.5481	726.1525	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	226.6003	200.3435	212.9622	187.8274	182.4045	164.7444	162.9957	169.3381	171.0245	190.2190	201.6171	224.2294	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3023	86.0515	85.5184	84.2693	82.0758	79.8000	79.8000	79.8000	79.8000	84.4447	85.8342	86.3584	(217)
Fuel for water heating, kWh/month	262.5658	232.8180	249.0250	222.8896	222.2392	206.4466	204.2553	212.2031	214.3165	225.2588	234.8914	259.6498	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.5753	18.1107	16.3067	11.9470	9.2282	7.5395	8.4183	10.9424	14.2131	18.6483	21.0632	23.2027	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.8338	-30.8192	-46.4567	-54.8598	-61.4568	-58.2005	-57.4834	-53.1199	-45.8334	-36.3804	-23.4105	-17.8467	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.7510	-16.6409	-33.7103	-51.5774	-69.1360	-69.8150	-69.0007	-57.9979	-41.9512	-24.1135	-10.4485	-6.1050	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3471.0682	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2746.5591	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	182.1953	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-964.9484	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5520.8741	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3471.0682	0.2100	728.9243	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2746.5591	0.2100	576.7774	(264)
Space and water heating			1305.7017	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	182.1953	0.1443	26.2964	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-506.7010	0.1336	-67.6896	
PV Unit electricity exported	-458.2474	0.1254	-57.4432	
Total			-125.1328	(269)
Total CO2, kg/year			1218.7946	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.6100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3471.0682	1.1300	3922.3071	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2746.5591	1.1300	3103.6118	(278)
Space and water heating			7025.9188	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	182.1953	1.5338	279.4572	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-506.7010	1.4937	-756.8418	
PV Unit electricity exported	-458.2474	0.4601	-210.8441	
Total			-967.6858	(283)
Total Primary energy kWh/year			6467.7910	(286)
Target Primary Energy Rate (TPER)			82.8200	(287)

Full SAP Calculation Printout

Plot Reference	P-01	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-01
Plot Address	Flat 1, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.87	**TER**	15.66
Environmental	94 A	**% DER < TER**			56.13
CO_2 Emissions (t/year)	0.44	**DFEE**	48.48	**TFEE**	48.82
Compliance Check	See BREL	**% DFEE < TFEE**			0.71
% DPER < TPER	15.01	**DPER**	70.64	**TPER**	83.11

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.0900 (1b)	x	2.5500 (2b)	=	199.1295	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0900					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.1295	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1507	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9500	(17)
Infiltration rate		0.2982	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2534	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3231	0.3168	0.3105	0.2788	0.2724	0.2408	0.2408	0.2344	0.2534	0.2724	0.2851	0.2978	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5522	0.5502	0.5482	0.5389	0.5371	0.5290	0.5290	0.5275	0.5321	0.5371	0.5406	0.5443	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.6900	1.1450	7.6603			(27)
Window-GBY			19.0800	1.1450	21.8473			(27)
Ground Floor			78.0900	0.1200	9.3708	110.0000	8589.9000	(28a)
Brickwork	88.2700	25.7700	62.5000	0.2100	13.1250	110.0000	6874.9996	(29a)
Communal Wall	17.6300	2.1500	15.4800	0.2200	3.4056	110.0000	1702.7999	(29a)
Lift Shaft	15.1000		15.1000	0.1600	2.4160	110.0000	1661.0000	(29a)
Total net area of external elements Aum(A, m2)			199.0900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.4050			(33)
Main dwelling								
Party Ceiling 1			78.0900			30.0000	2342.7000	(32b)
Internal Wall 1			142.1700			9.0000	1279.5300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 22450.9296 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.5007 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.4400	0.0500	0.5720

E4 Jamb	38.8400	0.0160	0.6214	
E5 Ground floor (normal)	42.1100	0.1120	4.7163	
E7 Party floor between dwellings (in blocks of flats)	42.1100	0.0380	1.6002	
E16 Corner (normal)	20.6500	0.0540	1.1151	
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8539 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 68.2589 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.2869	36.1537	36.0231	35.4098	35.2951	34.7609	34.7609	34.6620	34.9667	35.2951	35.5272	35.7699	(38)
Heat transfer coeff	104.5458	104.4126	104.2821	103.6687	103.5540	103.0198	103.0198	102.9209	103.2256	103.5540	103.7861	104.0288	(39)
Average = Sum(39)m / 12 =												103.6682	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3388	1.3371	1.3354	1.3276	1.3261	1.3192	1.3192	1.3180	1.3219	1.3261	1.3291	1.3322	(40)
HLP (average)												1.3275	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4256 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.0278	27.6115	27.0254	25.9446	25.1353	24.2379	23.7532	24.3353	24.9690	25.9293	27.0323	27.9330	(42b)

Hot water usage for other uses

39.4708	38.0355	36.6002	35.1649	33.7296	32.2943	32.2943	33.7296	35.1649	36.6002	38.0355	39.4708	(42c)

Average daily hot water use (litres/day) 61.8687 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.4986	65.6470	63.6255	61.1095	58.8649	56.5322	56.0475	58.0649	60.1339	62.5294	65.0678	67.4038	(44)
Energy conte	106.9012	93.4805	97.7901	83.6558	79.2434	69.5129	67.7846	71.8964	74.1511	84.8519	92.7010	105.5381	(45)
Energy content (annual)											Total = Sum(45)m =	1027.5070	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

90.8660	79.4584	83.1216	71.1074	67.3569	59.0860	57.6169	61.1120	63.0285	72.1241	78.7958	89.7074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

90.8660	79.4584	83.1216	71.1074	67.3569	59.0860	57.6169	61.1120	63.0285	72.1241	78.7958	89.7074	(64)
									Total per year (kWh/year) = Sum(64)m =		873.3810	(64)
12Total per year (kWh/year)											873	(64)

Electric shower(s)

51.9656	46.3018	50.5598	48.2486	49.1539	46.8881	48.4510	49.1539	48.2486	50.5598	49.6090	51.9656	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							591.1055	(64a)

Heat gains from water heating, kWh/month

35.7079	31.4400	33.4203	29.8390	29.1277	26.4935	26.5170	27.5665	27.8193	30.6710	32.1012	35.4182	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.6458	120.2864	108.6458	112.2673	108.6458	112.2673	108.6458	108.6458	112.2673	108.6458	112.2673	108.6458	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4024	217.6376	212.0049	200.0137	184.8770	170.6505	161.1464	158.9112	164.5438	176.5351	191.6718	205.8982	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	(71)
Water heating gains (Table 5)	47.9945	46.7858	44.9198	41.4430	39.1501	36.7965	35.6411	37.0517	38.6379	41.2244	44.5850	47.6052	(72)
Total internal gains	431.4269	444.0940	424.9548	413.1084	392.0572	379.0987	364.8176	363.9930	374.8333	385.7895	407.9085	421.5335	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6900	11.2829	0.3300	0.0000	0.7700	19.1802	(75)
Northeast	10.6500	11.2829	0.3300	0.0000	0.7700	30.5335	(75)
Southeast	5.6200	36.7938	0.3300	0.0000	0.7700	52.5431	(77)
Northwest	2.8100	11.2829	0.3300	0.0000	0.7700	8.0563	(81)

Solar gains	110.3131	207.0928	334.3225	499.6736	637.6543	667.3432	629.1159	520.9323	390.7563	242.6243	135.6241	92.1438	(83)
Total gains	541.7400	651.1869	759.2773	912.7820	1029.7115	1046.4418	993.9335	884.9252	765.5896	628.4138	543.5326	513.6773	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.6520	59.7281	59.8029	60.1567	60.2234	60.5356	60.5356	60.5938	60.4150	60.2234	60.0887	59.9485	
alpha	4.9768	4.9819	4.9869	5.0104	5.0149	5.0357	5.0357	5.0396	5.0277	5.0149	5.0059	4.9966	
util living area	0.9980	0.9945	0.9837	0.9350	0.8047	0.6058	0.4513	0.5241	0.8026	0.9709	0.9953	0.9984	(86)
MIT	19.5650	19.7693	20.0885	20.5218	20.8396	20.9697	20.9943	20.9885	20.8832	20.4431	19.9248	19.5283	(87)
Th 2	19.8106	19.8119	19.8132	19.8193	19.8205	19.8258	19.8258	19.8268	19.8237	19.8205	19.8181	19.8157	(88)
util rest of house	0.9972	0.9924	0.9770	0.9092	0.7397	0.5055	0.3335	0.3962	0.7112	0.9544	0.9930	0.9978	(89)
MIT 2	18.5231	18.7273	19.0431	19.4590	19.7259	19.8146	19.8247	19.8243	19.7684	19.3968	18.8878	18.4905	(90)
Living area fraction										fLA = Living area / (4) =		0.3945	(91)
MIT	18.9342	19.1384	19.4555	19.8783	20.1653	20.2703	20.2862	20.2836	20.2082	19.8096	19.2969	18.8999	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9342	19.1384	19.4555	19.8783	20.1653	20.2703	20.2862	20.2836	20.2082	19.8096	19.2969	18.8999	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9907	0.9744	0.9108	0.7603	0.5447	0.3802	0.4471	0.7442	0.9542	0.9917	0.9971	(94)
Useful gains	539.7407	645.1542	739.8750	831.3249	782.8725	570.0371	377.8977	395.6810	569.7341	599.6115	539.0005	512.2108	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1529.9405	1486.6666	1351.0293	1138.1117	876.6128	584.1566	379.7492	399.7070	630.5260	953.6938	1265.8729	1529.2167	(97)
Space heating kWh	736.7087	565.4964	454.6988	220.8865	69.7428	0.0000	0.0000	0.0000	0.0000	263.4372	523.3482	756.6524	(98a)
Space heating requirement - total per year (kWh/year)												3590.9708	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	736.7087	565.4964	454.6988	220.8865	69.7428	0.0000	0.0000	0.0000	0.0000	263.4372	523.3482	756.6524	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3590.9708	
Space heating per m2											(98c) / (4) =	45.9850	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	968.3864	762.3468	782.1989	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9052	0.9493	0.9175	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	876.6068	723.7248	717.6759	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1181.5082	1122.2518	996.9577	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	219.5290	296.5041	207.7857	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	54.8823	74.1260	51.9464	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												180.9547	(107)
Energy for space heating												45.9850	(99)
Energy for space cooling												2.3173	(108)
Total												48.3023	(109)
Fabric Energy Efficiency (DFEE)												48.3	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		78.0900	(1b)	x 2.5500	(2b) =	199.1295	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0900						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		199.1295	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1507	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.4007	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3406	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4342	0.4257	0.4172	0.3746	0.3661	0.3235	0.3235	0.3150	0.3406	0.3661	0.3831	0.4002	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5943	0.5906	0.5870	0.5702	0.5670	0.5523	0.5523	0.5496	0.5580	0.5670	0.5734	0.5801	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			17.3800	1.1450	19.9008			(27)
Ground Floor			78.0900	0.1300	10.1517			(28a)
Brickwork	88.2700	17.3800	70.8900	0.1800	12.7602			(29a)
Communal Wall	17.6300	2.1500	15.4800	0.1800	2.7864			(29a)
Lift Shaft	15.1000		15.1000	0.1800	2.7180			(29a)
Total net area of external elements Aum(A, m2)			199.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.4671			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.5007	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.4400	0.0500	0.5720
E4 Jamb	38.8400	0.0500	1.9420
E5 Ground floor (normal)	42.1100	0.1600	6.7376
E7 Party floor between dwellings (in blocks of flats)	42.1100	0.0700	2.9477
E16 Corner (normal)	20.6500	0.0900	1.8585
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0900	-0.7155

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.3423	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	63.8094	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.0511	38.8105	38.5747	37.4673	37.2601	36.2955	36.2955	36.1169	36.6670	37.2601	37.6792	38.1175	(38)
Heat transfer coeff	102.8604	102.6199	102.3841	101.2766	101.0694	100.1048	100.1048	99.9262	100.4764	101.0694	101.4886	101.9268	(39)
Average = Sum(39)m / 12 =												101.2756	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3172	1.3141	1.3111	1.2969	1.2943	1.2819	1.2819	1.2796	1.2867	1.2943	1.2996	1.3052	(40)
HLP (average)												1.2969	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4256	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.0278	27.6115	27.0254	25.9446	25.1353	24.2379	23.7532	24.3353	24.9690	25.9293	27.0323	27.9330	(42b)

Hot water usage for other uses

39.4708	38.0355	36.6002	35.1649	33.7296	32.2943	32.2943	33.7296	35.1649	36.6002	38.0355	39.4708	(42c)

Average daily hot water use (litres/day)	61.8687	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.4986	65.6470	63.6255	61.1095	58.8649	56.5322	56.0475	58.0649	60.1339	62.5294	65.0678	67.4038	(44)
Energy conte	106.9012	93.4805	97.7901	83.6558	79.2434	69.5129	67.7846	71.8964	74.1511	84.8519	92.7010	105.5381	(45)
Energy content (annual)										Total = Sum(45)m =		1027.5070	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

90.8660	79.4584	83.1216	71.1074	67.3569	59.0860	57.6169	61.1120	63.0285	72.1241	78.7958	89.7074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

90.8660	79.4584	83.1216	71.1074	67.3569	59.0860	57.6169	61.1120	63.0285	72.1241	78.7958	89.7074	(64)
								Total per year (kWh/year) = Sum(64)m =			873.3810	(64)
12Total per year (kWh/year)											873	(64)

Electric shower(s)

51.9656	46.3018	50.5598	48.2486	49.1539	46.8881	48.4510	49.1539	48.2486	50.5598	49.6090	51.9656	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							591.1055	(64a)

Heat gains from water heating, kWh/month

35.7079	31.4400	33.4203	29.8390	29.1277	26.4935	26.5170	27.5665	27.8193	30.6710	32.1012	35.4182	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	108.6497	120.2907	108.6497	112.2713	108.6497	112.2713	108.6497	108.6497	112.2713	108.6497	112.2713	108.6497	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.4024	217.6376	212.0049	200.0137	184.8770	170.6505	161.1464	158.9112	164.5438	176.5351	191.6718	205.8982	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	(71)
Water heating gains (Table 5)													
	47.9945	46.7858	44.9198	41.4430	39.1501	36.7965	35.6411	37.0517	38.6379	41.2244	44.5850	47.6052	(72)
Total internal gains													
	431.4309	444.0984	424.9587	413.1124	392.0611	379.1027	364.8215	363.9969	374.8373	385.7935	407.9125	421.5374	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.7000	11.2829	0.6300	0.7000	0.7700	40.3441	(75)
Southeast	3.7900	36.7938	0.6300	0.7000	0.7700	42.6173	(77)
Northwest	1.8900	11.2829	0.6300	0.7000	0.7700	6.5171	(81)

Solar gains	89.4785	167.9804	271.1827	405.3082	517.2325	541.3153	510.3070	422.5528	316.9592	196.8017	110.0093	74.7408	(83)
Total gains	520.9094	612.0788	696.1414	818.4206	909.2936	920.4180	875.1285	786.5497	691.7966	582.5952	517.9218	496.2782	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.6294	60.7715	60.9115	61.5776	61.7038	62.2984	62.2984	62.4097	62.0680	61.7038	61.4490	61.1848	
alpha	5.0420	5.0514	5.0608	5.1052	5.1136	5.1532	5.1532	5.1606	5.1379	5.1136	5.0966	5.0790	
util living area													
	0.9983	0.9958	0.9884	0.9538	0.8500	0.6594	0.4959	0.5686	0.8380	0.9776	0.9962	0.9987	(86)
MIT	19.5691	19.7537	20.0475	20.4668	20.7997	20.9595	20.9922	20.9851	20.8637	20.4226	19.9281	19.5436	(87)
Th 2	19.8274	19.8298	19.8321	19.8432	19.8453	19.8550	19.8550	19.8568	19.8513	19.8453	19.8411	19.8367	(88)
util rest of house													
	0.9976	0.9941	0.9835	0.9340	0.7922	0.5574	0.3709	0.4356	0.7537	0.9644	0.9943	0.9982	(89)
MIT 2	18.5401	18.7258	19.0186	19.4311	19.7220	19.8394	19.8535	19.8535	19.7835	19.3986	18.9089	18.5219	(90)
Living area fraction										fLA = Living area / (4) =		0.3945	(91)
MIT	18.9461	19.1314	19.4245	19.8397	20.1472	20.2813	20.3028	20.2999	20.2097	19.8026	19.3110	18.9250	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9461	19.1314	19.4245	19.8397	20.1472	20.2813	20.3028	20.2999	20.2097	19.8026	19.3110	18.9250	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9928	0.9813	0.9339	0.8090	0.5971	0.4206	0.4887	0.7833	0.9638	0.9931	0.9976	(94)
Useful gains	519.2958	607.6593	683.0902	764.3488	735.5999	549.5530	368.1010	384.3926	541.8808	561.4837	514.3716	495.0736	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1506.5036	1460.4239	1323.2652	1107.9387	853.7504	568.7258	370.6675	389.7072	613.8774	930.1014	1239.2802	1500.8765	(97)
Space heating kWh													
	734.4826	573.0578	476.2902	247.3848	87.9039	0.0000	0.0000	0.0000	0.0000	274.2516	521.9342	748.3174	(98a)
Space heating requirement - total per year (kWh/year)												3663.6224	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	734.4826	573.0578	476.2902	247.3848	87.9039	0.0000	0.0000	0.0000	0.0000	274.2516	521.9342	748.3174	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3663.6224	
Space heating per m2											(98c) / (4) =	46.9154	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	940.9856	740.7759	759.4393	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8743	0.9306	0.8934	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	822.7235	689.3292	678.4562	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1034.2032	983.3846	881.9692	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	152.2654	218.7772	151.4136	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	38.0663	54.6943	37.8534	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												130.6141	(107)
Energy for space heating												46.9154	(99)
Energy for space cooling												1.6726	(108)
Total												48.5880	(109)
Fabric Energy Efficiency (TFEE)												48.6	(109)

Full SAP Calculation Printout

Plot Reference	P-01	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-01
Plot Address	Flat 1, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.87	**TER**	15.66
Environmental	94 A	**% DER < TER**			56.13
CO_2 Emissions (t/year)	0.44	**DFEE**	48.48	**TFEE**	48.82
Compliance Check	See BREL	**% DFEE < TFEE**			0.71
% DPER < TPER	15.01	**DPER**	70.64	**TPER**	83.11

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.0900	(1b)	x 2.5500	(2b) =	199.1295	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0900					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	199.1295	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9500	(17)
Infiltration rate		0.1475	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000	(23c)
Effective ac	0.3039	0.3007	0.2976	0.2819	0.2788	0.2631	0.2631	0.2600	0.2694	0.2788	0.2850	0.2913	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.6900	1.1450	7.6603			(27)
Window-GBY			19.0800	1.1450	21.8473			(27)
Ground Floor			78.0900	0.1200	9.3708	110.0000	8589.9000	(28a)
Brickwork	88.2700	25.7700	62.5000	0.2100	13.1250	110.0000	6874.9996	(29a)
Communal Wall	17.6300	2.1500	15.4800	0.2200	3.4056	110.0000	1702.7999	(29a)
Lift Shaft	15.1000		15.1000	0.1600	2.4160	110.0000	1661.0000	(29a)
Total net area of external elements Aum(A, m2)			199.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.4050			(33)
Main dwelling								
Party Ceiling 1			78.0900			30.0000	2342.7000	(32b)
Internal Wall 1			142.1700			9.0000	1279.5300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22450.9296	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							287.5007	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	11.4400	0.0500	0.5720	
E4 Jamb	38.8400	0.0160	0.6214	
E5 Ground floor (normal)	42.1100	0.1120	4.7163	
E7 Party floor between dwellings (in blocks of flats)	42.1100	0.0380	1.6002	
E16 Corner (normal)	20.6500	0.0540	1.1151	
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.8539	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	68.2589	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.9670	19.7611	19.5551	18.5252	18.3193	17.2894	17.2894	17.0835	17.7014	18.3193	18.7312	19.1431	(38)
Heat transfer coeff	88.2259	88.0200	87.8140	86.7842	86.5782	85.5484	85.5484	85.3424	85.9603	86.5782	86.9901	87.4021	(39)
Average = Sum(39)m / 12 =												86.7327	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1298	1.1272	1.1245	1.1113	1.1087	1.0955	1.0955	1.0929	1.1008	1.1087	1.1140	1.1192	(40)
HLP (average)												1.1107	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.4256	(42)
Hot water usage for mixer showers	64.8894	63.9142	62.4932	59.7744	57.7680	55.5304	54.2586	55.6688	57.2147	59.6172	62.3944	64.6408	(42a)
Hot water usage for baths	28.0278	27.6115	27.0254	25.9446	25.1353	24.2379	23.7532	24.3353	24.9690	25.9293	27.0323	27.9330	(42b)
Hot water usage for other uses	39.4708	38.0355	36.6002	35.1649	33.7296	32.2943	32.2943	33.7296	35.1649	36.6002	38.0355	39.4708	(42c)
Average daily hot water use (litres/day)												121.6945	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3880	129.5612	126.1188	120.8838	116.6328	112.0626	110.3061	113.7337	117.3487	122.1466	127.4622	132.0446	(44)
Energy conte	209.6702	184.4935	193.8399	165.4839	157.0102	137.7941	133.4056	140.8261	144.7026	165.7518	181.5933	206.7499	(45)
Energy content (annual)										Total = Sum(45)m =		2021.3211	
Distribution loss (46)m = 0.15 x (45)m	31.4505	27.6740	29.0760	24.8226	23.5515	20.6691	20.0108	21.1239	21.7054	24.8628	27.2390	31.0125	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)
										Total per year (kWh/year) = Sum(64)m =		2338.6521	(64)
12Total per year (kWh/year)												2339	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.7153	61.3441	64.4518	55.0234	52.2059	45.8165	44.3574	46.8247	48.1136	55.1125	60.3798	68.7443	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.6458	120.2864	108.6458	112.2673	108.6458	112.2673	108.6458	108.6458	112.2673	108.6458	112.2673	108.6458	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4024	217.6376	212.0049	200.0137	184.8770	170.6505	161.1464	158.9112	164.5438	176.5351	191.6718	205.8982	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	(71)
Water heating gains (Table 5)	93.7034	91.2858	86.6287	76.4214	70.1692	63.6341	59.6201	62.9364	66.8245	74.0759	83.8608	92.3983	(72)
Total internal gains	477.1358	488.5941	466.6637	448.0867	423.0762	405.9362	388.7966	389.8777	403.0199	418.6411	447.1842	466.3266	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6900	11.2829	0.3300	0.0000	0.7700	19.1802	(75)
Northeast	10.6500	11.2829	0.3300	0.0000	0.7700	30.5335	(75)
Southeast	5.6200	36.7938	0.3300	0.0000	0.7700	52.5431	(77)
Northwest	2.8100	11.2829	0.3300	0.0000	0.7700	8.0563	(81)

Solar gains	110.3131	207.0928	334.3225	499.6736	637.6543	667.3432	629.1159	520.9323	390.7563	242.6243	135.6241	92.1438	(83)

Total gains	587.4489	695.6869	800.9862	947.7603	1060.7306	1073.2793	1017.9125	910.8099	793.7762	661.2653	582.8083	558.4705	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6863	70.8518	71.0179	71.8607	72.0316	72.8988	72.8988	73.0747	72.5494	72.0316	71.6905	71.3527	
alpha	5.7124	5.7235	5.7345	5.7907	5.8021	5.8599	5.8599	5.8716	5.8366	5.8021	5.7794	5.7568	
util living area													
	0.9968	0.9913	0.9728	0.8927	0.7154	0.5052	0.3691	0.4293	0.7073	0.9495	0.9923	0.9976	(86)
MIT	19.9069	20.1038	20.3911	20.7480	20.9428	20.9935	20.9991	20.9980	20.9608	20.6633	20.2213	19.8761	(87)
Th 2	19.9766	19.9787	19.9809	19.9916	19.9937	20.0045	20.0045	20.0067	20.0002	19.9937	19.9894	19.9851	(88)
util rest of house													
	0.9957	0.9880	0.9629	0.8593	0.6525	0.4290	0.2860	0.3376	0.6212	0.9255	0.9889	0.9967	(89)
MIT 2	18.7155	18.9673	19.3285	19.7567	19.9526	20.0015	20.0043	20.0061	19.9779	19.6746	19.1263	18.6826	(90)
Living area fraction										fLA = Living area / (4) =		0.3945	(91)
MIT	19.1856	19.4157	19.7478	20.1479	20.3433	20.3929	20.3968	20.3975	20.3657	20.0647	19.5583	19.1535	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1856	19.4157	19.7478	20.1479	20.3433	20.3929	20.3968	20.3975	20.3657	20.0647	19.5583	19.1535	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9857	0.9601	0.8650	0.6752	0.4590	0.3188	0.3738	0.6541	0.9275	0.9870	0.9957	(94)
Useful gains	584.1563	685.7505	769.0507	819.8284	716.2155	492.6765	324.5358	340.4835	519.2303	613.3456	575.2238	556.0688	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1313.2932	1277.6754	1163.3388	976.1353	748.3203	495.5715	324.8099	341.1526	538.5992	819.4357	1083.7504	1306.9665	(97)
Space heating kWh													
	542.4779	397.7736	293.3503	112.5410	23.8859	0.0000	0.0000	0.0000	0.0000	153.3311	366.1391	558.6679	(98a)
Space heating requirement - total per year (kWh/year)												2448.1668	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	542.4779	397.7736	293.3503	112.5410	23.8859	0.0000	0.0000	0.0000	0.0000	153.3311	366.1391	558.6679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2448.1668	
Space heating per m2											(98c) / (4) =	31.3506	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	542.4779	397.7736	293.3503	112.5410	23.8859	0.0000	0.0000	0.0000	0.0000	153.3311	366.1391	558.6679	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	542.4779	397.7736	293.3503	112.5410	23.8859	0.0000	0.0000	0.0000	0.0000	153.3311	366.1391	558.6679	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	72.9143	64.3525	68.0363	59.0306	56.6873	50.4980	49.4136	51.7002	52.6268	59.3810	63.9946	72.0145	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.5986	14.0891	15.5986	15.0954	15.5986	15.0954	15.5986	15.5986	15.0954	15.5986	15.0954	15.5986	(231)
Lighting	22.1130	17.7399	15.9728	11.7024	9.0392	7.3851	8.2459	10.7183	13.9221	18.2665	20.6320	22.7276	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2448.1668	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												720.6496	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	183.6611	(230a)
Total electricity for the above, kWh/year	183.6611	(231)
Electricity for lighting (calculated in Appendix L)	178.4648	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3530.9423	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2448.1668	0.1566	383.3995	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	720.6496	0.1412	101.7480	(264)
Space and water heating			485.1475	(265)
Pumps, fans and electric keep-hot	183.6611	0.1387	25.4761	(267)
Energy for lighting	178.4648	0.1443	25.7580	(268)
Total CO2, kg/year			536.3815	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.8700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2448.1668	1.5798	3867.5403	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	720.6496	1.5221	1096.8871	(278)
Space and water heating			4964.4274	(279)
Pumps, fans and electric keep-hot	183.6611	1.5128	277.8425	(281)
Energy for lighting	178.4648	1.5338	273.7353	(282)
Total Primary energy kWh/year			5516.0052	(286)
Dwelling Primary energy Rate (DPER)			70.6400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.0900	(1b) x	2.5500	(2b) =	199.1295	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		199.1295	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1507	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4007	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3406	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4342	0.4257	0.4172	0.3746	0.3661	0.3235	0.3235	0.3150	0.3406	0.3661	0.3831	0.4002	(22b)
Effective ac	0.5943	0.5906	0.5870	0.5702	0.5670	0.5523	0.5523	0.5496	0.5580	0.5670	0.5734	0.5801	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			17.3800	1.1450	19.9008			(27)
Ground Floor			78.0900	0.1300	10.1517			(28a)
Brickwork	88.2700	17.3800	70.8900	0.1800	12.7602			(29a)
Communal Wall	17.6300	2.1500	15.4800	0.1800	2.7864			(29a)
Lift Shaft	15.1000		15.1000	0.1800	2.7180			(29a)
Total net area of external elements Aum(A, m2)			199.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.4671			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.5007	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4400	0.0500	0.5720
E4 Jamb	38.8400	0.0500	1.9420
E5 Ground floor (normal)	42.1100	0.1600	6.7376
E7 Party floor between dwellings (in blocks of flats)	42.1100	0.0700	2.9477
E16 Corner (normal)	20.6500	0.0900	1.8585
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0900	-0.7155

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.3423	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	63.8094	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.0511	38.8105	38.5747	37.4673	37.2601	36.2955	36.2955	36.1169	36.6670	37.2601	37.6792	38.1175	(38)
Heat transfer coeff	102.8604	102.6199	102.3841	101.2766	101.0694	100.1048	100.1048	99.9262	100.4764	101.0694	101.4886	101.9268	(39)
Average = Sum(39)m / 12 =												101.2756	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3172	1.3141	1.3111	1.2969	1.2943	1.2819	1.2819	1.2796	1.2867	1.2943	1.2996	1.3052	(40)
HLP (average)												1.2969	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4256	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	64.8894	63.9142	62.4932	59.7744	57.7680	55.5304	54.2586	55.6688	57.2147	59.6172	62.3944	64.6408	(42a)
Hot water usage for baths	28.0278	27.6115	27.0254	25.9446	25.1353	24.2379	23.7532	24.3353	24.9690	25.9293	27.0323	27.9330	(42b)
Hot water usage for other uses	39.4708	38.0355	36.6002	35.1649	33.7296	32.2943	32.2943	33.7296	35.1649	36.6002	38.0355	39.4708	(42c)
Average daily hot water use (litres/day)												121.6945	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3880	129.5612	126.1188	120.8838	116.6328	112.0626	110.3061	113.7337	117.3487	122.1466	127.4622	132.0446	(44)
Energy conte	209.6702	184.4935	193.8399	165.4839	157.0102	137.7941	133.4056	140.8261	144.7026	165.7518	181.5933	206.7499	(45)
Energy content (annual)										Total = Sum(45)m =		2021.3211	
Distribution loss (46)m = 0.15 x (45)m	31.4505	27.6740	29.0760	24.8226	23.5515	20.6691	20.0108	21.1239	21.7054	24.8628	27.2390	31.0125	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.2651	226.5792	240.4348	210.5758	203.6051	182.8859	180.0005	187.4210	189.7945	212.3467	226.6851	253.3448	(62)
WWHRS	-29.6647	-26.2357	-27.4725	-22.7483	-21.2006	-18.1415	-17.0048	-18.0829	-18.7699	-22.1277	-25.0680	-29.1154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	226.6003	200.3435	212.9622	187.8274	182.4045	164.7444	162.9957	169.3381	171.0245	190.2190	201.6171	224.2294	(64)
										Total per year (kWh/year) = Sum(64)m =		2294.3063	(64)
12Total per year (kWh/year)												2294	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	106.9913	95.0127	101.7277	91.0969	89.4818	81.8900	81.6333	84.1006	84.1871	92.3884	96.4532	106.0203	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	121.2811	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.6497	120.2907	108.6497	112.2713	108.6497	112.2713	108.6497	108.6497	112.2713	108.6497	112.2713	108.6497	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4024	217.6376	212.0049	200.0137	184.8770	170.6505	161.1464	158.9112	164.5438	176.5351	191.6718	205.8982	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	35.1281	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	(71)
Water heating gains (Table 5)	143.8054	141.3879	136.7307	126.5235	120.2713	113.7361	109.7222	113.0384	116.9265	124.1780	133.9628	142.5004	(72)
Total internal gains	530.2418	541.7005	519.7697	501.1928	476.1822	456.0423	438.9026	439.9836	453.1260	471.7470	500.2903	519.4326	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.7000	11.2829	0.6300	0.7000	0.7700	40.3441	(75)
Southeast	3.7900	36.7938	0.6300	0.7000	0.7700	42.6173	(77)
Northwest	1.8900	11.2829	0.6300	0.7000	0.7700	6.5171	(81)

Solar gains	89.4785	167.9804	271.1827	405.3082	517.2325	541.3153	510.3070	422.5528	316.9592	196.8017	110.0093	74.7408	(83)
Total gains	619.7203	709.6809	790.9524	906.5010	993.4147	997.3576	949.2095	862.5364	770.0853	668.5487	610.2996	594.1734	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.6294	60.7715	60.9115	61.5776	61.7038	62.2984	62.2984	62.4097	62.0680	61.7038	61.4490	61.1848	
alpha	5.0420	5.0514	5.0608	5.1052	5.1136	5.1532	5.1532	5.1606	5.1379	5.1136	5.0966	5.0790	
util living area	0.9962	0.9920	0.9803	0.9336	0.8124	0.6172	0.4592	0.5230	0.7902	0.9616	0.9920	0.9970	(86)
MIT	19.6854	19.8666	20.1519	20.5456	20.8407	20.9699	20.9945	20.9898	20.8982	20.5105	20.0353	19.6594	(87)
Th 2	19.8274	19.8298	19.8321	19.8432	19.8453	19.8550	19.8550	19.8568	19.8513	19.8453	19.8411	19.8367	(88)
util rest of house	0.9948	0.9889	0.9724	0.9077	0.7492	0.5180	0.3424	0.3983	0.6987	0.9410	0.9884	0.9958	(89)
MIT 2	18.3240	18.5563	18.9178	19.4042	19.7238	19.8406	19.8537	19.8540	19.7899	19.3756	18.7806	18.2976	(90)
Living area fraction										fLA = Living area / (4) =		0.3945	(91)
MIT	18.8612	19.0733	19.4047	19.8545	20.1645	20.2861	20.3038	20.3021	20.2272	19.8234	19.2756	18.8349	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8612	19.0733	19.4047	19.8545	20.1645	20.2861	20.3038	20.3021	20.2272	19.8234	19.2756	18.8349	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9862	0.9687	0.9080	0.7682	0.5567	0.3887	0.4479	0.7315	0.9405	0.9859	0.9944	(94)
Useful gains	615.4541	699.8669	766.1890	823.0803	763.1652	555.1878	368.9840	386.3440	563.2975	628.7962	601.7037	590.8276	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1497.7672	1454.4626	1321.2355	1109.4373	855.4980	569.2093	370.7684	389.9215	615.6390	932.2005	1235.6868	1491.6862	(97)
Space heating kWh	656.4410	507.0883	412.9546	206.1770	68.6956	0.0000	0.0000	0.0000	0.0000	225.7328	456.4679	670.2388	(98a)
Space heating requirement - total per year (kWh/year)												3203.7959	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	656.4410	507.0883	412.9546	206.1770	68.6956	0.0000	0.0000	0.0000	0.0000	225.7328	456.4679	670.2388	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3203.7959	
Space heating per m2											(98c) / (4) =	41.0270	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	656.4410	507.0883	412.9546	206.1770	68.6956	0.0000	0.0000	0.0000	0.0000	225.7328	456.4679	670.2388	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	711.2037	549.3915	447.4048	223.3770	74.4264	0.0000	0.0000	0.0000	0.0000	244.5642	494.5481	726.1525	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	226.6003	200.3435	212.9622	187.8274	182.4045	164.7444	162.9957	169.3381	171.0245	190.2190	201.6171	224.2294	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3023	86.0515	85.5184	84.2693	82.0758	79.8000	79.8000	79.8000	79.8000	84.4447	85.8342	86.3584	(217)
Fuel for water heating, kWh/month	262.5658	232.8180	249.0250	222.8896	222.2392	206.4466	204.2553	212.2031	214.3165	225.2588	234.8914	259.6498	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.5753	18.1107	16.3067	11.9470	9.2282	7.5395	8.4183	10.9424	14.2131	18.6483	21.0632	23.2027	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.8338	-30.8192	-46.4567	-54.8598	-61.4568	-58.2005	-57.4834	-53.1199	-45.8334	-36.3804	-23.4105	-17.8467	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.7510	-16.6409	-33.7103	-51.5774	-69.1360	-69.8150	-69.0007	-57.9979	-41.9512	-24.1135	-10.4485	-6.1050	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3471.0682	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2746.5591	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	182.1953	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-964.9484	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5520.8741	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3471.0682	0.2100	728.9243	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2746.5591	0.2100	576.7774	(264)
Space and water heating			1305.7017	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	182.1953	0.1443	26.2964	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-506.7010	0.1336	-67.6896	
PV Unit electricity exported	-458.2474	0.1254	-57.4432	
Total			-125.1328	(269)
Total CO2, kg/year			1218.7946	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.6100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3471.0682	1.1300	3922.3071	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2746.5591	1.1300	3103.6118	(278)
Space and water heating			7025.9188	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	182.1953	1.5338	279.4572	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-506.7010	1.4937	-756.8418	
PV Unit electricity exported	-458.2474	0.4601	-210.8441	
Total			-967.6858	(283)
Total Primary energy kWh/year			6467.7910	(286)
Target Primary Energy Rate (TPER)			82.8200	(287)

Full SAP Calculation Printout

Plot Reference	P-01	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-01
Plot Address	Flat 1, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.87	**TER**	15.66
Environmental	94 A	**% DER < TER**			56.13
CO_2 Emissions (t/year)	0.44	**DFEE**	48.48	**TFEE**	48.82
Compliance Check	See BREL	**% DFEE < TFEE**			0.71
% DPER < TPER	15.01	**DPER**	70.64	**TPER**	83.11

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.0900	(1b)	x 2.5500	(2b) =	199.1295	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0900					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	199.1295	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9500 (17)
Infiltration rate		0.1475 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		71.2000 (23c)

Effective ac	0.3039	0.3007	0.2976	0.2819	0.2788	0.2631	0.2631	0.2600	0.2694	0.2788	0.2850	0.2913	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.6900	1.1450	7.6603			(27)
Window-GBY			19.0800	1.1450	21.8473			(27)
Ground Floor			78.0900	0.1200	9.3708	110.0000	8589.9000	(28a)
Brickwork	88.2700	25.7700	62.5000	0.2100	13.1250	110.0000	6874.9996	(29a)
Communal Wall	17.6300	2.1500	15.4800	0.2200	3.4056	110.0000	1702.7999	(29a)
Lift Shaft	15.1000		15.1000	0.1600	2.4160	110.0000	1661.0000	(29a)
Total net area of external elements Aum(A, m2)			199.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.4050			(33)
Main dwelling								
Party Ceiling 1			78.0900			30.0000	2342.7000	(32b)
Internal Wall 1			142.1700			9.0000	1279.5300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22450.9296	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							287.5007	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	11.4400	0.0500	0.5720	
E4 Jamb	38.8400	0.0160	0.6214	
E5 Ground floor (normal)	42.1100	0.1120	4.7163	
E7 Party floor between dwellings (in blocks of flats)	42.1100	0.0380	1.6002	
E16 Corner (normal)	20.6500	0.0540	1.1151	
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.8539	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	68.2589	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.9670	19.7611	19.5551	18.5252	18.3193	17.2894	17.2894	17.0835	17.7014	18.3193	18.7312	19.1431	(38)
Heat transfer coeff	88.2259	88.0200	87.8140	86.7842	86.5782	85.5484	85.5484	85.3424	85.9603	86.5782	86.9901	87.4021	(39)
Average = Sum(39)m / 12 =												86.7327	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1298	1.1272	1.1245	1.1113	1.1087	1.0955	1.0955	1.0929	1.1008	1.1087	1.1140	1.1192	(40)
HLP (average)												1.1107	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.4256	(42)
Hot water usage for mixer showers	64.8894	63.9142	62.4932	59.7744	57.7680	55.5304	54.2586	55.6688	57.2147	59.6172	62.3944	64.6408	(42a)
Hot water usage for baths	28.0278	27.6115	27.0254	25.9446	25.1353	24.2379	23.7532	24.3353	24.9690	25.9293	27.0323	27.9330	(42b)
Hot water usage for other uses	39.4708	38.0355	36.6002	35.1649	33.7296	32.2943	32.2943	33.7296	35.1649	36.6002	38.0355	39.4708	(42c)
Average daily hot water use (litres/day)												121.6945	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3880	129.5612	126.1188	120.8838	116.6328	112.0626	110.3061	113.7337	117.3487	122.1466	127.4622	132.0446	(44)
Energy conte	209.6702	184.4935	193.8399	165.4839	157.0102	137.7941	133.4056	140.8261	144.7026	165.7518	181.5933	206.7499	(45)
Energy content (annual)										Total = Sum(45)m =		2021.3211	
Distribution loss (46)m = 0.15 x (45)m	31.4505	27.6740	29.0760	24.8226	23.5515	20.6691	20.0108	21.1239	21.7054	24.8628	27.2390	31.0125	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)
										Total per year (kWh/year) = Sum(64)m =		2338.6521	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.7153	61.3441	64.4518	55.0234	52.2059	45.8165	44.3574	46.8247	48.1136	55.1125	60.3798	68.7443	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.2635	22.4389	18.2485	13.8153	10.3271	8.7186	9.4207	12.2454	16.4358	20.8690	24.3572	25.9657	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.4961	324.8322	316.4253	298.5279	275.9358	254.7023	240.5170	237.1809	245.5878	263.4852	286.0774	307.3108	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	(71)
Water heating gains (Table 5)	93.7034	91.2858	86.6287	76.4214	70.1692	63.6341	59.6201	62.9364	66.8245	74.0759	83.8608	92.3983	(72)
Total internal gains	540.9548	539.0487	521.7942	489.2564	456.9238	427.5467	410.0496	412.8545	429.3398	458.9218	494.7871	526.1666	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6900	11.2829	0.3300	0.0000	0.7700	19.1802	(75)
Northeast	10.6500	11.2829	0.3300	0.0000	0.7700	30.5335	(75)
Southeast	5.6200	36.7938	0.3300	0.0000	0.7700	52.5431	(77)
Northwest	2.8100	11.2829	0.3300	0.0000	0.7700	8.0563	(81)

Solar gains	110.3131	207.0928	334.3225	499.6736	637.6543	667.3432	629.1159	520.9323	390.7563	242.6243	135.6241	92.1438	(83)
Total gains	651.2679	746.1415	856.1167	988.9300	1094.5781	1094.8898	1039.1656	933.7867	820.0961	701.5461	630.4112	618.3104	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6863	70.8518	71.0179	71.8607	72.0316	72.8988	72.8988	73.0747	72.5494	72.0316	71.6905	71.3527	
alpha	5.7124	5.7235	5.7345	5.7907	5.8021	5.8599	5.8599	5.8716	5.8366	5.8021	5.7794	5.7568	
util living area	0.9947	0.9878	0.9639	0.8771	0.6982	0.4957	0.3616	0.4189	0.6893	0.9365	0.9888	0.9960	(86)
MIT	19.9835	20.1623	20.4478	20.7743	20.9495	20.9941	20.9992	20.9983	20.9656	20.6992	20.2768	19.9485	(87)
Th 2	19.9766	19.9787	19.9809	19.9916	19.9937	20.0045	20.0045	20.0067	20.0002	19.9937	19.9894	19.9851	(88)
util rest of house	0.9928	0.9834	0.9514	0.8410	0.6353	0.4207	0.2802	0.3293	0.6036	0.9081	0.9840	0.9945	(89)
MIT 2	18.8129	19.0407	19.3968	19.7841	19.9578	20.0018	20.0043	20.0062	19.9809	19.7143	19.1959	18.7749	(90)
Living area fraction										fLA = Living area / (4) =		0.3945	(91)
MIT	19.2748	19.4832	19.8115	20.1748	20.3490	20.3933	20.3968	20.3976	20.3694	20.1029	19.6224	19.2379	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2748	19.4832	19.8115	20.1748	20.3490	20.3933	20.3968	20.3976	20.3694	20.1029	19.6224	19.2379	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9807	0.9489	0.8482	0.6583	0.4503	0.3123	0.3647	0.6365	0.9117	0.9817	0.9931	(94)
Useful gains	645.4099	731.7639	812.3356	838.7810	720.5396	492.9882	324.5689	340.5776	522.0255	639.5972	618.8716	614.0209	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1321.1650	1283.6146	1168.9339	978.4750	748.8175	495.6071	324.8141	341.1642	538.9191	822.7454	1089.3240	1314.3450	(97)
Space heating kWh	502.7618	370.8437	265.3091	100.5797	21.0388	0.0000	0.0000	0.0000	0.0000	136.2623	338.7257	521.0411	(98a)
Space heating requirement - total per year (kWh/year)												2256.5622	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	502.7618	370.8437	265.3091	100.5797	21.0388	0.0000	0.0000	0.0000	0.0000	136.2623	338.7257	521.0411	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2256.5622	
Space heating per m2											(98c) / (4) =	28.8969	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	502.7618	370.8437	265.3091	100.5797	21.0388	0.0000	0.0000	0.0000	0.0000	136.2623	338.7257	521.0411	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	502.7618	370.8437	265.3091	100.5797	21.0388	0.0000	0.0000	0.0000	0.0000	136.2623	338.7257	521.0411	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	72.9143	64.3525	68.0363	59.0306	56.6873	50.4980	49.4136	51.7002	52.6268	59.3810	63.9946	72.0145	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.5986	14.0891	15.5986	15.0954	15.5986	15.0954	15.5986	15.5986	15.0954	15.5986	15.0954	15.5986	(231)
Lighting	22.1130	17.7399	15.9728	11.7024	9.0392	7.3851	8.2459	10.7183	13.9221	18.2665	20.6320	22.7276	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 2256.5622 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 720.6496 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	183.6611	(230a)
Total electricity for the above, kWh/year	183.6611	(231)
Electricity for lighting (calculated in Appendix L)	178.4648	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3339.3377	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2256.5622	16.4900	372.1071	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	720.6496	16.4900	118.8351	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	183.6611	16.4900	30.2857	(249)
Energy for lighting	178.4648	16.4900	29.4289	(250)
Additional standing charges			0.0000	(251)
Total energy cost			550.6568	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6105	(257)
SAP value		73.8938	
SAP rating (Section 12)		74	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2256.5622	0.1567	353.6464	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	720.6496	0.1412	101.7480	(264)
Space and water heating			455.3944	(265)
Pumps, fans and electric keep-hot	183.6611	0.1387	25.4761	(267)
Energy for lighting	178.4648	0.1443	25.7580	(268)
Total CO2, kg/year			506.6285	(272)
CO2 emissions per m2			6.4900	(273)
EI value			94.4847	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.0900 (1b)	x	2.5500 (2b)	=	199.1295	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 78.0900						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.1295	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9500	(17)
Infiltration rate		0.1475	(18)
Number of sides sheltered		2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1348	0.1285	0.1285	0.1191	0.1222	0.1066	0.1066	0.1034	0.1066	0.1191	0.1160	0.1254	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 71.2000 (23c)

Effective ac	0.2788	0.2725	0.2725	0.2631	0.2662	0.2506	0.2506	0.2474	0.2506	0.2631	0.2600	0.2694	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.6900	1.1450	7.6603			(27)
Window-GBY			19.0800	1.1450	21.8473			(27)
Ground Floor			78.0900	0.1200	9.3708	110.0000	8589.9000	(28a)
Brickwork	88.2700	25.7700	62.5000	0.2100	13.1250	110.0000	6874.9996	(29a)
Communal Wall	17.6300	2.1500	15.4800	0.2200	3.4056	110.0000	1702.7999	(29a)
Lift Shaft	15.1000		15.1000	0.1600	2.4160	110.0000	1661.0000	(29a)
Total net area of external elements Aum(A, m2)			199.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.4050			(33)
Main dwelling								
Party Ceiling 1			78.0900			30.0000	2342.7000	(32b)
Internal Wall 1			142.1700			9.0000	1279.5300	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22450.9296 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 287.5007 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.4400	0.0500	0.5720
E4 Jamb	38.8400	0.0160	0.6214
E5 Ground floor (normal)	42.1100	0.1120	4.7163
E7 Party floor between dwellings (in blocks of flats)	42.1100	0.0380	1.6002
E16 Corner (normal)	20.6500	0.0540	1.1151
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8539 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 68.2589 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.3193	17.9073	17.9073	17.2894	17.4954	16.4656	16.4656	16.2596	16.4656	17.2894	17.0835	17.7014	(38)
Heat transfer coeff	86.5782	86.1663	86.1663	85.5484	85.7543	84.7245	84.7245	84.5185	84.7245	85.5484	85.3424	85.9603	(39)

Average = Sum(39)m / 12 = 85.4797

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1087	1.1034	1.1034	1.0955	1.0981	1.0850	1.0850	1.0823	1.0850	1.0955	1.0929	1.1008	(40)
HLP (average)												1.0946	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4256 (42)
Hot water usage for mixer showers

64.8894	63.9142	62.4932	59.7744	57.7680	55.5304	54.2586	55.6688	57.2147	59.6172	62.3944	64.6408	(42a)

Hot water usage for baths

28.0278	27.6115	27.0254	25.9446	25.1353	24.2379	23.7532	24.3353	24.9690	25.9293	27.0323	27.9330	(42b)

Hot water usage for other uses

39.4708	38.0355	36.6002	35.1649	33.7296	32.2943	32.2943	33.7296	35.1649	36.6002	38.0355	39.4708	(42c)

Average daily hot water use (litres/day) 121.6945 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3880	129.5612	126.1188	120.8838	116.6328	112.0626	110.3061	113.7337	117.3487	122.1466	127.4622	132.0446	(44)
Energy conte	209.6702	184.4935	193.8399	165.4839	157.0102	137.7941	133.4056	140.8261	144.7026	165.7518	181.5933	206.7499	(45)

Energy content (annual) Total = Sum(45)m = 2021.3211

Distribution loss (46)m = 0.15 x (45)m

31.4505	27.6740	29.0760	24.8226	23.5515	20.6691	20.0108	21.1239	21.7054	24.8628	27.2390	31.0125	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)

Total per year (kWh/year) = Sum(64)m = 2338.6521 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

69.7153	61.3441	64.4518	55.0234	52.2059	45.8165	44.3574	46.8247	48.1136	55.1125	60.3798	68.7443	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.2635	22.4389	18.2485	13.8153	10.3271	8.7186	9.4207	12.2454	16.4358	20.8690	24.3572	25.9657	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	321.4961	324.8322	316.4253	298.5279	275.9358	254.7023	240.5170	237.1809	245.5878	263.4852	286.0774	307.3108	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	(71)
Water heating gains (Table 5)													
	93.7034	91.2858	86.6287	76.4214	70.1692	63.6341	59.6201	62.9364	66.8245	74.0759	83.8608	92.3983	(72)
Total internal gains													
	540.9548	539.0487	521.7942	489.2564	456.9238	427.5467	410.0496	412.8545	429.3398	458.9218	494.7871	526.1666	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6900	13.7804	0.3300	0.0000	0.7700	23.4257	(75)
Northeast	10.6500	13.7804	0.3300	0.0000	0.7700	37.2921	(75)
Southeast	5.6200	43.0593	0.3300	0.0000	0.7700	61.4905	(77)
Northwest	2.8100	13.7804	0.3300	0.0000	0.7700	9.8395	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	132.0478	217.6865	351.1036	534.9249	665.4357	736.2917	687.4598	583.7646	438.3669	274.4242	160.1523	110.7870	(83)
Total gains	673.0026	756.7351	872.8978	1024.1813	1122.3595	1163.8384	1097.5095	996.6190	867.7067	733.3460	654.9394	636.9536	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	72.0316	72.3760	72.3760	72.8988	72.7237	73.6076	73.6076	73.7870	73.6076	72.8988	73.0747	72.5494	
alpha	5.8021	5.8251	5.8251	5.8599	5.8482	5.9072	5.9072	5.9191	5.9072	5.8599	5.8716	5.8366	
util living area													
	0.9919	0.9828	0.9470	0.8200	0.6041	0.3778	0.2547	0.2882	0.5753	0.8943	0.9809	0.9938	(86)
MIT	20.1240	20.2894	20.5731	20.8642	20.9794	20.9989	20.9999	20.9998	20.9886	20.8057	20.4215	20.0922	(87)
Th 2	19.9937	19.9980	19.9980	20.0045	20.0023	20.0131	20.0131	20.0153	20.0131	20.0045	20.0067	20.0002	(88)
util rest of house													
	0.9889	0.9766	0.9289	0.7731	0.5356	0.3065	0.1786	0.2048	0.4858	0.8508	0.9727	0.9914	(89)
MIT 2	19.0045	19.2158	19.5622	19.8892	19.9898	20.0128	20.0131	20.0153	20.0080	19.8399	19.3905	18.9694	(90)
Living area fraction									fLA = Living area / (4) =			0.3945	(91)
MIT	19.4462	19.6394	19.9611	20.2738	20.3802	20.4018	20.4025	20.4037	20.3949	20.2210	19.7973	19.4124	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4462	19.6394	19.9611	20.2738	20.3802	20.4018	20.4025	20.4037	20.3949	20.2210	19.7973	19.4124	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9867	0.9738	0.9282	0.7867	0.5620	0.3347	0.2086	0.2377	0.5210	0.8615	0.9705	0.9895	(94)
Useful gains	664.0550	736.9042	810.1856	805.7047	630.8030	389.4830	228.9472	236.9304	452.1172	631.7525	635.6036	630.2925	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1242.0669	1201.1054	1082.3397	887.4650	641.4620	389.8888	228.9645	236.9670	457.0814	746.0636	1006.8088	1230.2972	(97)
Space heating kWh													
	430.0408	311.9432	202.4826	58.8674	7.9303	0.0000	0.0000	0.0000	0.0000	85.0475	267.2677	446.4035	(98a)
Space heating requirement - total per year (kWh/year)												1809.9831	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	430.0408	311.9432	202.4826	58.8674	7.9303	0.0000	0.0000	0.0000	0.0000	85.0475	267.2677	446.4035	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1809.9831	
Space heating per m2											(98c) / (4) =	23.1782	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	430.0408	311.9432	202.4826	58.8674	7.9303	0.0000	0.0000	0.0000	0.0000	85.0475	267.2677	446.4035	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	430.0408	311.9432	202.4826	58.8674	7.9303	0.0000	0.0000	0.0000	0.0000	85.0475	267.2677	446.4035	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
236.6216 208.8367 220.7913 191.5659 183.9616 163.8761 160.3570 167.7775 170.7846 192.7032 207.6753 233.7013 (64)
Efficiency of water heater 324.5200 (216)
(217)m 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 (217)
Fuel for water heating, kWh/month
72.9143 64.3525 68.0363 59.0306 56.6873 50.4980 49.4136 51.7002 52.6268 59.3810 63.9946 72.0145 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 15.5986 14.0891 15.5986 15.0954 15.5986 15.0954 15.5986 15.5986 15.0954 15.5986 15.0954 15.5986 (231)
Lighting 22.1130 17.7399 15.9728 11.7024 9.0392 7.3851 8.2459 10.7183 13.9221 18.2665 20.6320 22.7276 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 1809.9831 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 720.6496 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)
mechanical ventilation fans (SFP = 0.7560) 183.6611 (230a)
Total electricity for the above, kWh/year 183.6611 (231)
Electricity for lighting (calculated in Appendix L) 178.4648 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2892.7586 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1809.9831	27.6700	500.8223	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	720.6496	27.6700	199.4037	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	183.6611	27.6700	50.8190	(249)
Energy for lighting	178.4648	27.6700	49.3812	(250)
Additional standing charges			0.0000	(251)
Total energy cost			800.4263	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1809.9831	0.1575	285.1399	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	720.6496	0.1412	101.7480	(264)
Space and water heating			386.8879	(265)
Pumps, fans and electric keep-hot	183.6611	0.1387	25.4761	(267)
Energy for lighting	178.4648	0.1443	25.7580	(268)
Total CO2, kg/year			438.1220	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1809.9831	1.5832	2865.5490	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	720.6496	1.5221	1096.8871	(278)
Space and water heating			3962.4361	(279)
Pumps, fans and electric keep-hot	183.6611	1.5128	277.8425	(281)
Energy for lighting	178.4648	1.5338	273.7353	(282)
Total Primary energy kWh/year			4514.0139	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 74
Current environmental impact rating: A 94

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 74
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£800	£800	£0
Space heating	£552	£552	£0
Water heating	£199	£199	£0
Lighting	£49	£49	£0
Total cost of fuels	£800	£800	£0
Total cost of uses	£800	£800	£0
Delivered energy	37 kWh/m²	37 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	58 kWh/m²	58 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.0900	(1b)	x 2.5500	(2b) =	199.1295	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	199.1295	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9500 (17)
Infiltration rate		0.1475 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	71.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3039	0.3007	0.2976	0.2819	0.2788	0.2631	0.2631	0.2600	0.2694	0.2788	0.2850	0.2913	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.6900	1.1450	7.6603			(27)
Window-GBY			19.0800	1.1450	21.8473			(27)
Ground Floor			78.0900	0.1200	9.3708	110.0000	8589.9000	(28a)
Brickwork	88.2700	25.7700	62.5000	0.2100	13.1250	110.0000	6874.9996	(29a)
Communal Wall	17.6300	2.1500	15.4800	0.2200	3.4056	110.0000	1702.7999	(29a)
Lift Shaft	15.1000		15.1000	0.1600	2.4160	110.0000	1661.0000	(29a)
Total net area of external elements Aum(A, m2)			199.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.4050			(33)
Main dwelling								
Party Ceiling 1			78.0900			30.0000	2342.7000	(32b)
Internal Wall 1			142.1700			9.0000	1279.5300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22450.9296 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		287.5007 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4400	0.0500	0.5720
E4 Jamb	38.8400	0.0160	0.6214
E5 Ground floor (normal)	42.1100	0.1120	4.7163
E7 Party floor between dwellings (in blocks of flats)	42.1100	0.0380	1.6002
E16 Corner (normal)	20.6500	0.0540	1.1151
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.8539 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	68.2589 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.9670	19.7611	19.5551	18.5252	18.3193	17.2894	17.2894	17.0835	17.7014	18.3193	18.7312	19.1431	(38)
Heat transfer coeff	88.2259	88.0200	87.8140	86.7842	86.5782	85.5484	85.5484	85.3424	85.9603	86.5782	86.9901	87.4021	(39)
Average = Sum(39)m / 12 =												86.7327	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1298	1.1272	1.1245	1.1113	1.1087	1.0955	1.0955	1.0929	1.1008	1.1087	1.1140	1.1192	(40)
HLP (average)												1.1107	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4256 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
64.8894	63.9142	62.4932	59.7744	57.7680	55.5304	54.2586	55.6688	57.2147	59.6172	62.3944	64.6408	(42a)

Hot water usage for baths

28.0278	27.6115	27.0254	25.9446	25.1353	24.2379	23.7532	24.3353	24.9690	25.9293	27.0323	27.9330	(42b)

Hot water usage for other uses

39.4708	38.0355	36.6002	35.1649	33.7296	32.2943	32.2943	33.7296	35.1649	36.6002	38.0355	39.4708	(42c)

Average daily hot water use (litres/day)		121.6945 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3880	129.5612	126.1188	120.8838	116.6328	112.0626	110.3061	113.7337	117.3487	122.1466	127.4622	132.0446	(44)
Energy conte	209.6702	184.4935	193.8399	165.4839	157.0102	137.7941	133.4056	140.8261	144.7026	165.7518	181.5933	206.7499	(45)
Energy content (annual)										Total = Sum(45)m =		2021.3211	
Distribution loss (46)m = 0.15 x (45)m	31.4505	27.6740	29.0760	24.8226	23.5515	20.6691	20.0108	21.1239	21.7054	24.8628	27.2390	31.0125	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)
										Total per year (kWh/year) = Sum(64)m =		2338.6521	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.7153	61.3441	64.4518	55.0234	52.2059	45.8165	44.3574	46.8247	48.1136	55.1125	60.3798	68.7443	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.2635	22.4389	18.2485	13.8153	10.3271	8.7186	9.4207	12.2454	16.4358	20.8690	24.3572	25.9657	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.4961	324.8322	316.4253	298.5279	275.9358	254.7023	240.5170	237.1809	245.5878	263.4852	286.0774	307.3108	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	(71)
Water heating gains (Table 5)	93.7034	91.2858	86.6287	76.4214	70.1692	63.6341	59.6201	62.9364	66.8245	74.0759	83.8608	92.3983	(72)
Total internal gains	540.9548	539.0487	521.7942	489.2564	456.9238	427.5467	410.0496	412.8545	429.3398	458.9218	494.7871	526.1666	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6900	11.2829	0.3300	0.0000	0.7700	19.1802	(75)
Northeast	10.6500	11.2829	0.3300	0.0000	0.7700	30.5335	(75)
Southeast	5.6200	36.7938	0.3300	0.0000	0.7700	52.5431	(77)
Northwest	2.8100	11.2829	0.3300	0.0000	0.7700	8.0563	(81)

Solar gains	110.3131	207.0928	334.3225	499.6736	637.6543	667.3432	629.1159	520.9323	390.7563	242.6243	135.6241	92.1438	(83)
Total gains	651.2679	746.1415	856.1167	988.9300	1094.5781	1094.8898	1039.1656	933.7867	820.0961	701.5461	630.4112	618.3104	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6863	70.8518	71.0179	71.8607	72.0316	72.8988	72.8988	73.0747	72.5494	72.0316	71.6905	71.3527	
alpha	5.7124	5.7235	5.7345	5.7907	5.8021	5.8599	5.8599	5.8716	5.8366	5.8021	5.7794	5.7568	
util living area	0.9947	0.9878	0.9639	0.8771	0.6982	0.4957	0.3616	0.4189	0.6893	0.9365	0.9888	0.9960	(86)
MIT	19.9835	20.1623	20.4478	20.7743	20.9495	20.9941	20.9992	20.9983	20.9656	20.6992	20.2768	19.9485	(87)
Th 2	19.9766	19.9787	19.9809	19.9916	19.9937	20.0045	20.0045	20.0067	20.0002	19.9937	19.9894	19.9851	(88)
util rest of house	0.9928	0.9834	0.9514	0.8410	0.6353	0.4207	0.2802	0.3293	0.6036	0.9081	0.9840	0.9945	(89)
MIT 2	18.8129	19.0407	19.3968	19.7841	19.9578	20.0018	20.0043	20.0062	19.9809	19.7143	19.1959	18.7749	(90)
Living area fraction										fLA = Living area / (4) =		0.3945	(91)
MIT	19.2748	19.4832	19.8115	20.1748	20.3490	20.3933	20.3968	20.3976	20.3694	20.1029	19.6224	19.2379	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2748	19.4832	19.8115	20.1748	20.3490	20.3933	20.3968	20.3976	20.3694	20.1029	19.6224	19.2379	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9807	0.9489	0.8482	0.6583	0.4503	0.3123	0.3647	0.6365	0.9117	0.9817	0.9931	(94)
Useful gains	645.4099	731.7639	812.3356	838.7810	720.5396	492.9882	324.5689	340.5776	522.0255	639.5972	618.8716	614.0209	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1321.1650	1283.6146	1168.9339	978.4750	748.8175	495.6071	324.8141	341.1642	538.9191	822.7454	1089.3240	1314.3450	(97)
Space heating kWh	502.7618	370.8437	265.3091	100.5797	21.0388	0.0000	0.0000	0.0000	0.0000	136.2623	338.7257	521.0411	(98a)
Space heating requirement - total per year (kWh/year)												2256.5622	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	502.7618	370.8437	265.3091	100.5797	21.0388	0.0000	0.0000	0.0000	0.0000	136.2623	338.7257	521.0411	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2256.5622	
Space heating per m2										(98c) / (4) =		28.8969	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	502.7618	370.8437	265.3091	100.5797	21.0388	0.0000	0.0000	0.0000	0.0000	136.2623	338.7257	521.0411	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	502.7618	370.8437	265.3091	100.5797	21.0388	0.0000	0.0000	0.0000	0.0000	136.2623	338.7257	521.0411	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	72.9143	64.3525	68.0363	59.0306	56.6873	50.4980	49.4136	51.7002	52.6268	59.3810	63.9946	72.0145	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.5986	14.0891	15.5986	15.0954	15.5986	15.0954	15.5986	15.5986	15.0954	15.5986	15.0954	15.5986	(231)
Lighting	22.1130	17.7399	15.9728	11.7024	9.0392	7.3851	8.2459	10.7183	13.9221	18.2665	20.6320	22.7276	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2256.5622	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	720.6496	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	183.6611	(230a)
Total electricity for the above, kWh/year	183.6611	(231)
Electricity for lighting (calculated in Appendix L)	178.4648	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3339.3377	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2256.5622	16.4900	372.1071	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	720.6496	16.4900	118.8351	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	183.6611	16.4900	30.2857	(249)
Energy for lighting	178.4648	16.4900	29.4289	(250)
Additional standing charges			0.0000	(251)
Total energy cost			550.6568	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6105	(257)
SAP value		73.8938	
SAP rating (Section 12)		74	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2256.5622	0.1567	353.6464	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	720.6496	0.1412	101.7480	(264)
Space and water heating			455.3944	(265)
Pumps, fans and electric keep-hot	183.6611	0.1387	25.4761	(267)
Energy for lighting	178.4648	0.1443	25.7580	(268)
Total CO2, kg/year			506.6285	(272)
CO2 emissions per m2			6.4900	(273)
EI value			94.4847	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		78.0900	(1b)	x 2.5500	(2b) =	199.1295	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0900						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		199.1295	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9500 (17)
Infiltration rate		0.1475 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1348	0.1285	0.1285	0.1191	0.1222	0.1066	0.1066	0.1034	0.1066	0.1191	0.1160	0.1254	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	71.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2788	0.2725	0.2725	0.2631	0.2662	0.2506	0.2506	0.2474	0.2506	0.2631	0.2600	0.2694	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.6900	1.1450	7.6603			(27)
Window-GBY			19.0800	1.1450	21.8473			(27)
Ground Floor			78.0900	0.1200	9.3708	110.0000	8589.9000	(28a)
Brickwork	88.2700	25.7700	62.5000	0.2100	13.1250	110.0000	6874.9996	(29a)
Communal Wall	17.6300	2.1500	15.4800	0.2200	3.4056	110.0000	1702.7999	(29a)
Lift Shaft	15.1000		15.1000	0.1600	2.4160	110.0000	1661.0000	(29a)
Total net area of external elements Aum(A, m2)			199.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.4050			(33)
Main dwelling								
Party Ceiling 1			78.0900			30.0000	2342.7000	(32b)
Internal Wall 1			142.1700			9.0000	1279.5300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 22450.9296 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.5007 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4400	0.0500	0.5720
E4 Jamb	38.8400	0.0160	0.6214
E5 Ground floor (normal)	42.1100	0.1120	4.7163
E7 Party floor between dwellings (in blocks of flats)	42.1100	0.0380	1.6002
E16 Corner (normal)	20.6500	0.0540	1.1151
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.8539 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 68.2589 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.3193	17.9073	17.9073	17.2894	17.4954	16.4656	16.4656	16.2596	16.4656	17.2894	17.0835	17.7014	(38)
Heat transfer coeff	86.5782	86.1663	86.1663	85.5484	85.7543	84.7245	84.7245	84.5185	84.7245	85.5484	85.3424	85.9603	(39)
Average = Sum(39)m / 12 =												85.4797	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1087	1.1034	1.1034	1.0955	1.0981	1.0850	1.0850	1.0823	1.0850	1.0955	1.0929	1.1008	(40)
HLP (average)												1.0946	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4256 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
64.8894	63.9142	62.4932	59.7744	57.7680	55.5304	54.2586	55.6688	57.2147	59.6172	62.3944	64.6408	(42a)

Hot water usage for baths

28.0278	27.6115	27.0254	25.9446	25.1353	24.2379	23.7532	24.3353	24.9690	25.9293	27.0323	27.9330	(42b)

Hot water usage for other uses

39.4708	38.0355	36.6002	35.1649	33.7296	32.2943	32.2943	33.7296	35.1649	36.6002	38.0355	39.4708	(42c)

Average daily hot water use (litres/day)	121.6945 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3880	129.5612	126.1188	120.8838	116.6328	112.0626	110.3061	113.7337	117.3487	122.1466	127.4622	132.0446	(44)
Energy conte	209.6702	184.4935	193.8399	165.4839	157.0102	137.7941	133.4056	140.8261	144.7026	165.7518	181.5933	206.7499	(45)
Energy content (annual)										Total = Sum(45)m =		2021.3211	

Distribution loss (46)m = 0.15 x (45)m

31.4505	27.6740	29.0760	24.8226	23.5515	20.6691	20.0108	21.1239	21.7054	24.8628	27.2390	31.0125	(46)

Water storage loss (or HIU loss):	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)

Total per year (kWh/year) = Sum(64)m = 2338.6521 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	69.7153	61.3441	64.4518	55.0234	52.2059	45.8165	44.3574	46.8247	48.1136	55.1125	60.3798	68.7443	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	145.5373	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	25.2635	22.4389	18.2485	13.8153	10.3271	8.7186	9.4207	12.2454	16.4358	20.8690	24.3572	25.9657	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	321.4961	324.8322	316.4253	298.5279	275.9358	254.7023	240.5170	237.1809	245.5878	263.4852	286.0774	307.3108	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	51.9793	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	-97.0248	(71)

Water heating gains (Table 5)

	93.7034	91.2858	86.6287	76.4214	70.1692	63.6341	59.6201	62.9364	66.8245	74.0759	83.8608	92.3983	(72)

Total internal gains

	540.9548	539.0487	521.7942	489.2564	456.9238	427.5467	410.0496	412.8545	429.3398	458.9218	494.7871	526.1666	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6900	13.7804	0.3300	0.0000	0.7700	23.4257	(75)
Northeast	10.6500	13.7804	0.3300	0.0000	0.7700	37.2921	(75)
Southeast	5.6200	43.0593	0.3300	0.0000	0.7700	61.4905	(77)
Northwest	2.8100	13.7804	0.3300	0.0000	0.7700	9.8395	(81)

Solar gains	132.0478	217.6865	351.1036	534.9249	665.4357	736.2917	687.4598	583.7646	438.3669	274.4242	160.1523	110.7870	(83)
Total gains	673.0026	756.7351	872.8978	1024.1813	1122.3595	1163.8384	1097.5095	996.6190	867.7067	733.3460	654.9394	636.9536	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.0316	72.3760	72.3760	72.8988	72.7237	73.6076	73.6076	73.7870	73.6076	72.8988	73.0747	72.5494	
alpha	5.8021	5.8251	5.8251	5.8599	5.8482	5.9072	5.9072	5.9191	5.9072	5.8599	5.8716	5.8366	
util living area	0.9919	0.9828	0.9470	0.8200	0.6041	0.3778	0.2547	0.2882	0.5753	0.8943	0.9809	0.9938	(86)
MIT	20.1240	20.2894	20.5731	20.8642	20.9794	20.9989	20.9999	20.9998	20.9886	20.8057	20.4215	20.0922	(87)
Th 2	19.9937	19.9980	19.9980	20.0045	20.0023	20.0131	20.0131	20.0153	20.0131	20.0045	20.0067	20.0002	(88)
util rest of house	0.9889	0.9766	0.9289	0.7731	0.5356	0.3065	0.1786	0.2048	0.4858	0.8508	0.9727	0.9914	(89)
MIT 2	19.0045	19.2158	19.5622	19.8892	19.9898	20.0128	20.0131	20.0153	20.0080	19.8399	19.3905	18.9694	(90)

Living area fraction fLA = Living area / (4) = 0.3945 (91)

MIT	19.4462	19.6394	19.9611	20.2738	20.3802	20.4018	20.4025	20.4037	20.3949	20.2210	19.7973	19.4124	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4462	19.6394	19.9611	20.2738	20.3802	20.4018	20.4025	20.4037	20.3949	20.2210	19.7973	19.4124	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9867	0.9738	0.9282	0.7867	0.5620	0.3347	0.2086	0.2377	0.5210	0.8615	0.9705	0.9895	(94)
Useful gains	664.0550	736.9042	810.1856	805.7047	630.8030	389.4830	228.9472	236.9304	452.1172	631.7525	635.6036	630.2925	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1242.0669	1201.1054	1082.3397	887.4650	641.4620	389.8888	228.9645	236.9670	457.0814	746.0636	1006.8088	1230.2972	(97)
Space heating kWh	430.0408	311.9432	202.4826	58.8674	7.9303	0.0000	0.0000	0.0000	0.0000	85.0475	267.2677	446.4035	(98a)

Space heating requirement - total per year (kWh/year) 1809.9831

Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh	430.0408	311.9432	202.4826	58.8674	7.9303	0.0000	0.0000	0.0000	0.0000	85.0475	267.2677	446.4035	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1809.9831

Space heating per m2 (98c) / (4) = 23.1782 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	430.0408	311.9432	202.4826	58.8674	7.9303	0.0000	0.0000	0.0000	0.0000	85.0475	267.2677	446.4035	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	430.0408	311.9432	202.4826	58.8674	7.9303	0.0000	0.0000	0.0000	0.0000	85.0475	267.2677	446.4035	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	236.6216	208.8367	220.7913	191.5659	183.9616	163.8761	160.3570	167.7775	170.7846	192.7032	207.6753	233.7013	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	72.9143	64.3525	68.0363	59.0306	56.6873	50.4980	49.4136	51.7002	52.6268	59.3810	63.9946	72.0145	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.5986	14.0891	15.5986	15.0954	15.5986	15.0954	15.5986	15.5986	15.0954	15.5986	15.0954	15.5986	(231)
Lighting	22.1130	17.7399	15.9728	11.7024	9.0392	7.3851	8.2459	10.7183	13.9221	18.2665	20.6320	22.7276	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1809.9831 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	720.6496 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)	
mechanical ventilation fans (SFP = 0.7560)	183.6611 (230a)
Total electricity for the above, kWh/year	183.6611 (231)
Electricity for lighting (calculated in Appendix L)	178.4648 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2892.7586 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1809.9831	27.6700	500.8223	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	720.6496	27.6700	199.4037	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	183.6611	27.6700	50.8190	(249)
Energy for lighting	178.4648	27.6700	49.3812	(250)
Additional standing charges			0.0000	(251)
Total energy cost			800.4263	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1809.9831	0.1575	285.1399	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	720.6496	0.1412	101.7480	(264)
Space and water heating			386.8879	(265)
Pumps, fans and electric keep-hot	183.6611	0.1387	25.4761	(267)
Energy for lighting	178.4648	0.1443	25.7580	(268)
Total CO2, kg/year			438.1220	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1809.9831	1.5832	2865.5490	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	720.6496	1.5221	1096.8871	(278)
Space and water heating			3962.4361	(279)
Pumps, fans and electric keep-hot	183.6611	1.5128	277.8425	(281)
Energy for lighting	178.4648	1.5338	273.7353	(282)
Total Primary energy kWh/year			4514.0139	(286)

Summary for Input Data

Plot Reference	P-02	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-02
Plot Address	Flat 2, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	77 C	**DER**	5.96	**TER**	14.01
Environmental	95 A	**% DER < TER**			57.46
CO_2 Emissions (t/year)	0.38	**DFEE**	42.92	**TFEE**	41.53
Compliance Check	See BREL	**% DFEE < TFEE**			-3.34
% DPER < TPER	17.29	**DPER**	61.40	**TPER**	74.24

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	291.87	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	42.11 m	78.41 m²	2.55 m

8.0 Living Area	30.88	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	89.13	64.66	0.00	None	24.47	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	15.82	13.76	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Lift Shaft	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.12	6.12	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	11.00	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	155.28

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	78.41

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	78.41

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-GBY	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	South West	2.06	
Patio Door	Window-Red	Brickwork	North East	6.50	
East	Window-Red	Brickwork	North East	10.33	
North	Window-Red	Brickwork	North West	2.18	
South	Window-GBY	Brickwork	South East	5.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	73.15	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	17.11	0.05	0.05		No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	8.55	-0.10	-0.10	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	3.60	0.33	0.33	AbbeyCalculated	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	7.66	0.00	0.00		No
E18 Party wall between dwellings	Gov Approved Scheme	2.85	0.04	0.04	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No
E1 Steel lintel with perforated steel base plate	Independently assessed	11.20	0.05	0.05		No
E4 Jamb	Independently assessed	37.69	0.02	0.02		Yes
E5 Ground floor (normal)	Gov Approved Scheme	42.11	0.11	0.11	RCD	No

Y-value	0.09	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	3
Manufacturer SFP	0.54
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	3
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0

Summary for Input Data

Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.72	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	8
Downlight	85.00	10.00	850.00	14

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

Summary for Input Data

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-02	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-02
Plot Address	Flat 2, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	77 C	**DER**	5.96	**TER**	14.01
Environmental	95 A	**% DER < TER**			57.46
CO_2 Emissions (t/year)	0.38	**DFEE**	42.92	**TFEE**	41.53
Compliance Check	See BREL	**% DFEE < TFEE**			-3.34
% DPER < TPER	17.29	**DPER**	61.40	**TPER**	74.24

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		78.4100	(1b)	x 2.5500	(2b) =	199.9455	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4100						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.9455	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.7200 (17)
Infiltration rate			0.1360 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1156 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1474	0.1445	0.1416	0.1272	0.1243	0.1098	0.1098	0.1069	0.1156	0.1243	0.1300	0.1358	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		71.2000 (23c)

Effective ac	0.2914	0.2885	0.2856	0.2712	0.2683	0.2538	0.2538	0.2509	0.2596	0.2683	0.2740	0.2798	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	89.1300	24.4600	64.6700	0.2100	13.5807	110.0000	7113.6997	(29a)
Communal Wall	15.8200	2.0600	13.7600	0.2200	3.0272	110.0000	1513.6000	(29a)
Lift Shaft	6.1200		6.1200	0.1600	0.9792	110.0000	673.2000	(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.7910			(33)
Main dwelling								
Party Wall 1			11.0000	0.0000	0.0000	110.0000	1210.0000	(32)
Party Floor 1			78.4100			70.0000	5488.7000	(32d)
Party Ceiling 1			78.4100			30.0000	2352.3000	(32b)
Internal Wall 1			155.2800			9.0000	1397.5200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19749.0196 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 251.8686 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.1500	0.0380	2.7797
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6000	0.3300	1.1880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E1 Steel lintel with perforated steel base plate	11.2000	0.0500	0.5600
E4 Jamb	37.6900	0.0160	0.6030
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1383 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.9293 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.2265	19.0358	18.8451	17.8917	17.7010	16.7476	16.7476	16.5569	17.1289	17.7010	18.0824	18.4637	(38)
Heat transfer coeff	79.1558	78.9651	78.7744	77.8210	77.6303	76.6769	76.6769	76.4862	77.0582	77.6303	78.0117	78.3930	(39)
Average = Sum(39)m / 12 =												77.7733	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0095	1.0071	1.0046	0.9925	0.9901	0.9779	0.9779	0.9755	0.9828	0.9901	0.9949	0.9998	(40)
HLP (average)												0.9919	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---
4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4320 (42)
Hot water usage for mixer showers

64.9963	64.0196	62.5962	59.8729	57.8632	55.6219	54.3480	55.7606	57.3090	59.7154	62.4972	64.7473	(42a)

Hot water usage for baths

28.0738	27.6568	27.0697	25.9871	25.1765	24.2777	23.7922	24.3752	25.0100	25.9718	27.0767	27.9789	(42b)

Hot water usage for other uses

39.5361	38.0984	36.6608	35.2231	33.7854	32.3477	32.3477	33.7854	35.2231	36.6608	38.0984	39.5361	(42c)

Average daily hot water use (litres/day) 121.8952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.6062	129.7748	126.3267	121.0831	116.8251	112.2474	110.4879	113.9212	117.5421	122.3480	127.6723	132.2623	(44)
Energy conte	210.0158	184.7977	194.1594	165.7568	157.2691	138.0212	133.6256	141.0582	144.9412	166.0251	181.8927	207.0908	(45)
Energy content (annual)										Total = Sum(45)m =		2024.6535	
Distribution loss (46)m = 0.15 x (45)m	31.5024	27.7196	29.1239	24.8635	23.5904	20.7032	20.0438	21.1587	21.7412	24.9038	27.2839	31.0636	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)
										Total per year (kWh/year) = Sum(64)m =		2341.9845	(64)
12Total per year (kWh/year)												2342	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.8303	61.4452	64.5580	55.1141	52.2920	45.8921	44.4305	46.9019	48.1929	55.2033	60.4793	68.8577	(65)

---
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9903	120.6678	108.9903	112.6233	108.9903	112.6233	108.9903	108.9903	112.6233	108.9903	112.6233	108.9903	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.0854	218.3277	212.6772	200.6479	185.4632	171.1916	161.6574	159.4151	165.0656	177.0948	192.2796	206.5511	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	(71)
Water heating gains (Table 5)	93.8579	91.4363	86.7715	76.5474	70.2849	63.7390	59.7184	63.0401	66.9347	74.1980	83.9990	92.5507	(72)
Total internal gains	478.4135	489.9118	467.9189	449.2986	424.2183	407.0339	389.8461	390.9255	404.1035	419.7631	448.3819	467.5720	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Northeast	16.8300	11.2829	0.3100	0.0000	0.7700	45.3272	(75)

Northwest				2.1800		11.2829		0.3100		0.0000		0.7700	5.8713 (81)
Solar gains	102.1522	191.0090	306.5181	455.5045	579.3109	605.5200	571.1355	474.1229	357.3789	223.2850	125.4518	85.4170 (83)	
Total gains	580.5657	680.9208	774.4370	904.8031	1003.5293	1012.5538	960.9815	865.0484	761.4824	643.0481	573.8337	552.9891 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.3043	69.4717	69.6398	70.4931	70.6662	71.5449	71.5449	71.7233	71.1908	70.6662	70.3207	69.9786	
alpha	5.6203	5.6314	5.6427	5.6995	5.7111	5.7697	5.7697	5.7816	5.7461	5.7111	5.6880	5.6652	
util living area	0.9945	0.9860	0.9611	0.8672	0.6849	0.4808	0.3505	0.4054	0.6689	0.9291	0.9872	0.9957	(86)
MIT	19.9617	20.1629	20.4446	20.7803	20.9514	20.9945	20.9993	20.9984	20.9687	20.7062	20.2758	19.9293	(87)
Th 2	20.0754	20.0774	20.0795	20.0896	20.0916	20.1018	20.1018	20.1038	20.0977	20.0916	20.0876	20.0835	(88)
util rest of house	0.9927	0.9817	0.9495	0.8340	0.6287	0.4151	0.2793	0.3271	0.5929	0.9023	0.9825	0.9944	(89)
MIT 2	18.8722	19.1285	19.4805	19.8810	20.0548	20.0990	20.1016	20.1033	20.0785	19.8104	19.2812	18.8371	(90)
Living area fraction									fLA = Living area / (4) =			0.3938	(91)
MIT	19.3013	19.5359	19.8602	20.2352	20.4079	20.4517	20.4551	20.4558	20.4291	20.1632	19.6729	19.2672	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3013	19.5359	19.8602	20.2352	20.4079	20.4517	20.4551	20.4558	20.4291	20.1632	19.6729	19.2672	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9785	0.9462	0.8397	0.6488	0.4409	0.3074	0.3580	0.6217	0.9048	0.9798	0.9927	(94)
Useful gains	575.2003	666.2622	732.7666	759.7826	651.1381	446.3954	295.3701	309.6828	473.4496	581.8170	562.2254	548.9709	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1187.4371	1155.7240	1052.4415	882.1133	675.9985	448.6864	295.5976	310.2127	487.7084	742.3942	980.8347	1181.1647	(97)
Space heating kWh	455.5042	328.9184	237.8381	88.0781	18.4962	0.0000	0.0000	0.0000	0.0000	119.4694	301.3986	470.3522	(98a)
Space heating requirement - total per year (kWh/year)												2020.0552	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	455.5042	328.9184	237.8381	88.0781	18.4962	0.0000	0.0000	0.0000	0.0000	119.4694	301.3986	470.3522	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2020.0552	
Space heating per m2										(98c) / (4) =		25.7627	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.5042	328.9184	237.8381	88.0781	18.4962	0.0000	0.0000	0.0000	0.0000	119.4694	301.3986	470.3522	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	455.5042	328.9184	237.8381	88.0781	18.4962	0.0000	0.0000	0.0000	0.0000	119.4694	301.3986	470.3522	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	73.0208	64.4462	68.1347	59.1146	56.7671	50.5680	49.4814	51.7717	52.7004	59.4652	64.0869	72.1195	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.9844	12.6311	13.9844	13.5333	13.9844	13.5333	13.9844	13.9844	13.5333	13.9844	13.5333	13.9844	(231)
Lighting	22.1831	17.7961	16.0235	11.7395	9.0679	7.4086	8.2720	10.7523	13.9662	18.3244	20.6974	22.7997	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2020.0552	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	324.5200	
Water heating fuel used	721.6765	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	164.6551	(230a)
Total electricity for the above, kWh/year	164.6551	(231)
Electricity for lighting (calculated in Appendix L)	179.0307	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3085.4176	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2020.0552	0.1568	316.7265	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	721.6765	0.1412	101.8934	(264)
Space and water heating			418.6198	(265)
Pumps, fans and electric keep-hot	164.6551	0.1387	22.8397	(267)
Energy for lighting	179.0307	0.1443	25.8397	(268)
Total CO2, kg/year			467.2992	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.9600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2020.0552	1.5804	3192.5842	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	721.6765	1.5221	1098.4516	(278)
Space and water heating			4291.0358	(279)
Pumps, fans and electric keep-hot	164.6551	1.5128	249.0903	(281)
Energy for lighting	179.0307	1.5338	274.6033	(282)
Total Primary energy kWh/year			4814.7294	(286)
Dwelling Primary energy Rate (DPER)			61.4000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.4100	(1b)	x 2.5500	(2b) =	199.9455	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		199.9455	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1500	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3400	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4335	0.4250	0.4165	0.3740	0.3655	0.3230	0.3230	0.3145	0.3400	0.3655	0.3825	0.3995	(22b)

Effective ac	0.5940	0.5903	0.5868	0.5700	0.5668	0.5522	0.5522	0.5495	0.5578	0.5668	0.5732	0.5798	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.5400	1.1450	20.0840			(27)
Brickwork	89.1300	17.5400	71.5900	0.1800	12.8862			(29a)
Communal Wall	15.8200	2.0600	13.7600	0.1800	2.4768			(29a)
Lift Shaft	6.1200		6.1200	0.1800	1.1016			(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6086			(33)
Main dwelling								
Party Wall 1			11.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	251.8686	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.1500	0.0700	5.1205
E16 Corner (normal)	17.1100	0.0900	1.5399
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0900	-0.7695
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6000	0.0200	0.0720
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E1 Steel lintel with perforated steel base plate	11.2000	0.0500	0.5600
E4 Jamb	37.6900	0.0500	1.8845
E5 Ground floor (normal)	42.1100	0.1600	6.7376

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.4870	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	54.0956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1920	38.9512	38.7152	37.6066	37.3992	36.4336	36.4336	36.2548	36.8055	37.3992	37.8188	38.2575	(38)
Heat transfer coeff	93.2876	93.0468	92.8108	91.7022	91.4948	90.5292	90.5292	90.3504	90.9011	91.4948	91.9144	92.3530	(39)
Average = Sum(39)m / 12 =												91.7012	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1897	1.1867	1.1837	1.1695	1.1669	1.1546	1.1546	1.1523	1.1593	1.1669	1.1722	1.1778	(40)
HLP (average)												1.1695	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4320	(42)
Hot water usage for mixer showers	64.9963	64.0196	62.5962	59.8729	57.8632	55.6219	54.3480	55.7606	57.3090	59.7154	62.4972	64.7473	(42a)
Hot water usage for baths	28.0738	27.6568	27.0697	25.9871	25.1765	24.2777	23.7922	24.3752	25.0100	25.9718	27.0767	27.9789	(42b)
Hot water usage for other uses	39.5361	38.0984	36.6608	35.2231	33.7854	32.3477	32.3477	33.7854	35.2231	36.6608	38.0984	39.5361	(42c)
Average daily hot water use (litres/day)												121.8952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.6062	129.7748	126.3267	121.0831	116.8251	112.2474	110.4879	113.9212	117.5421	122.3480	127.6723	132.2623	(44)
Energy conte	210.0158	184.7977	194.1594	165.7568	157.2691	138.0212	133.6256	141.0582	144.9412	166.0251	181.8927	207.0908	(45)
Energy content (annual)										Total = Sum(45)m =		2024.6535	
Distribution loss (46)m = 0.15 x (45)m	31.5024	27.7196	29.1239	24.8635	23.5904	20.7032	20.0438	21.1587	21.7412	24.9038	27.2839	31.0636	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.6107	226.8834	240.7543	210.8486	203.8640	183.1131	180.2205	187.6532	190.0330	212.6200	226.9845	253.6857	(62)
WWHRS	-29.7136	-26.2790	-27.5178	-22.7858	-21.2356	-18.1714	-17.0328	-18.1127	-18.8009	-22.1642	-25.1093	-29.1634	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	226.8971	200.6044	213.2365	188.0628	182.6284	164.9416	163.1877	169.5404	171.2322	190.4558	201.8752	224.5223	(64)
										Total per year (kWh/year) = Sum(64)m =		2297.1845	(64)
12Total per year (kWh/year)												2297	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	107.1062	95.1138	101.8339	91.1876	89.5679	81.9655	81.7064	84.1778	84.2664	92.4793	96.5528	106.1336	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9837	120.6605	108.9837	112.6165	108.9837	112.6165	108.9837	108.9837	112.6165	108.9837	112.6165	108.9837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.0854	218.3277	212.6772	200.6479	185.4632	171.1916	161.6574	159.4151	165.0656	177.0948	192.2796	206.5511	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	(71)
Water heating gains (Table 5)													
	143.9599	141.5384	136.8736	126.6494	120.3869	113.8410	109.8205	113.1422	117.0367	124.3001	134.1011	142.6527	(72)
Total internal gains													
	531.5090	543.0066	521.0144	502.3938	477.3138	457.1291	439.9415	441.0210	454.1988	472.8586	501.4772	520.6675	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	12.0700	11.2829	0.6300	0.7000	0.7700	41.6199	(75)
Southeast	3.9100	36.7938	0.6300	0.7000	0.7700	43.9667	(77)
Northwest	1.5600	11.2829	0.6300	0.7000	0.7700	5.3792	(81)

Solar gains	90.9658	170.5596	274.8334	410.0355	522.7137	546.8387	515.5981	427.2690	320.9808	199.6851	111.7990	76.0082	(83)
Total gains	622.4748	713.5662	795.8478	912.4294	1000.0275	1003.9679	955.5396	868.2899	775.1796	672.5437	613.2762	596.6757	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.8057	58.9578	59.1078	59.8223	59.9580	60.5975	60.5975	60.7174	60.3495	59.9580	59.6842	59.4007	
alpha	4.9204	4.9305	4.9405	4.9882	4.9972	5.0398	5.0398	5.0478	5.0233	4.9972	4.9789	4.9600	
util living area													
	0.9934	0.9863	0.9681	0.9030	0.7596	0.5612	0.4139	0.4725	0.7352	0.9409	0.9864	0.9946	(86)
MIT	19.7322	19.9276	20.2228	20.6131	20.8763	20.9784	20.9961	20.9928	20.9222	20.5681	20.0894	19.7044	(87)
Th 2	19.9282	19.9307	19.9331	19.9445	19.9466	19.9565	19.9565	19.9584	19.9527	19.9466	19.9423	19.9378	(88)
util rest of house													
	0.9912	0.9819	0.9577	0.8733	0.6989	0.4765	0.3173	0.3687	0.6501	0.9158	0.9812	0.9928	(89)
MIT 2	18.4722	18.7216	19.0931	19.5691	19.8499	19.9452	19.9554	19.9560	19.9038	19.5306	18.9372	18.4437	(90)
Living area fraction									fLA = Living area / (4) =			0.3938	(91)
MIT	18.9684	19.1966	19.5381	19.9802	20.2542	20.3521	20.3653	20.3643	20.3049	19.9392	19.3910	18.9402	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9684	19.1966	19.5381	19.9802	20.2542	20.3521	20.3653	20.3643	20.3049	19.9392	19.3910	18.9402	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9886	0.9780	0.9529	0.8744	0.7177	0.5094	0.3555	0.4097	0.6806	0.9156	0.9776	0.9905	(94)
Useful gains	615.3704	697.8335	758.3685	797.8567	717.7446	511.3909	339.6491	355.7573	527.5564	615.7493	599.5315	591.0308	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1368.3806	1330.2502	1210.0719	1016.0828	782.6607	520.7341	340.8672	358.1779	564.0292	854.4848	1129.7148	1361.3016	(97)
Space heating kWh													
	560.2396	424.9840	336.0673	157.1228	48.2976	0.0000	0.0000	0.0000	0.0000	177.6192	381.7319	573.0815	(98a)
Space heating requirement - total per year (kWh/year)												2659.1439	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	560.2396	424.9840	336.0673	157.1228	48.2976	0.0000	0.0000	0.0000	0.0000	177.6192	381.7319	573.0815	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2659.1439	
Space heating per m2											(98c) / (4) =	33.9133	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	560.2396	424.9840	336.0673	157.1228	48.2976	0.0000	0.0000	0.0000	0.0000	177.6192	381.7319	573.0815	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	606.9768	460.4377	364.1032	170.2306	52.3267	0.0000	0.0000	0.0000	0.0000	192.4368	413.5774	620.8901	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	226.8971	200.6044	213.2365	188.0628	182.6284	164.9416	163.1877	169.5404	171.2322	190.4558	201.8752	224.5223	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0040	85.7006	85.0753	83.6595	81.5282	79.8000	79.8000	79.8000	79.8000	83.9036	85.4658	86.0676	(217)
Fuel for water heating, kWh/month													
	263.8216	234.0758	250.6445	224.7955	224.0064	206.6938	204.4958	212.4567	214.5767	226.9937	236.2059	260.8676	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.6447	18.1664	16.3568	11.9837	9.2566	7.5627	8.4441	10.9760	14.2568	18.7056	21.1280	23.2740	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.9153	-30.9376	-46.6320	-55.0627	-61.6803	-58.4105	-57.6904	-53.3129	-46.0026	-36.5181	-23.5012	-17.9167	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-7.7866	-16.7170	-33.8635	-51.8107	-69.4476	-70.1296	-69.3120	-58.2602	-42.1417	-24.2237	-10.4965	-6.1332	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2880.9793	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2759.6338	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	182.7554	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-968.9027	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4940.4657	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2880.9793	0.2100	605.0056	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2759.6338	0.2100	579.5231	(264)
Space and water heating			1184.5288	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	182.7554	0.1443	26.3772	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-508.5804	0.1336	-67.9415	
PV Unit electricity exported	-460.3223	0.1254	-57.7035	
Total			-125.6451	(269)
Total CO2, kg/year			1097.1902	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2880.9793	1.1300	3255.5066	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2759.6338	1.1300	3118.3862	(278)
Space and water heating			6373.8928	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	182.7554	1.5338	280.3163	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-508.5804	1.4937	-759.6520	
PV Unit electricity exported	-460.3223	0.4601	-211.7996	
Total			-971.4516	(283)
Total Primary energy kWh/year			5812.8582	(286)
Target Primary Energy Rate (TPER)			74.1300	(287)

Full SAP Calculation Printout

Plot Reference	P-02	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-02
Plot Address	Flat 2, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	77 C	**DER**	5.96	**TER**	14.01
Environmental	95 A	**% DER < TER**			57.46
CO_2 Emissions (t/year)	0.38	**DFEE**	42.92	**TFEE**	41.53
Compliance Check	See BREL	**% DFEE < TFEE**			-3.34
% DPER < TPER	17.29	**DPER**	61.40	**TPER**	74.24

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.4100 (1b)	x	2.5500 (2b)	=	199.9455	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4100					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.9455	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1500	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7200	(17)
Infiltration rate		0.2860	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2431	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3100	0.3039	0.2978	0.2674	0.2614	0.2310	0.2310	0.2249	0.2431	0.2614	0.2735	0.2857	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5480	0.5462	0.5444	0.5358	0.5342	0.5267	0.5267	0.5253	0.5296	0.5342	0.5374	0.5408	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	89.1300	24.4600	64.6700	0.2100	13.5807	110.0000	7113.6997	(29a)
Communal Wall	15.8200	2.0600	13.7600	0.2200	3.0272	110.0000	1513.6000	(29a)
Lift Shaft	6.1200		6.1200	0.1600	0.9792	110.0000	673.2000	(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.7910			(33)
Main dwelling								
Party Wall 1			11.0000	0.0000	0.0000	110.0000	1210.0000	(32)
Party Floor 1			78.4100			70.0000	5488.7000	(32d)
Party Ceiling 1			78.4100			30.0000	2352.3000	(32b)
Internal Wall 1			155.2800			9.0000	1397.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19749.0196 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		251.8686 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	73.1500	0.0380	2.7797	
E16 Corner (normal)	17.1100	0.0540	0.9239	
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6000	0.3300	1.1880	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.6600	0.0000	0.0000	
E18 Party wall between dwellings	2.8500	0.0380	0.1083	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	
E1 Steel lintel with perforated steel base plate	11.2000	0.0500	0.5600	
E4 Jamb	37.6900	0.0160	0.6030	
E5 Ground floor (normal)	42.1100	0.1120	4.7163	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.1383 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	59.9293 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1614	36.0383	35.9176	35.3508	35.2448	34.7511	34.7511	34.6597	34.9413	35.2448	35.4593	35.6836	(38)
Heat transfer coeff	96.0907	95.9676	95.8469	95.2801	95.1741	94.6804	94.6804	94.5890	94.8706	95.1741	95.3886	95.6129	(39)
Average = Sum(39)m / 12 =												95.2796	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2255	1.2239	1.2224	1.2152	1.2138	1.2075	1.2075	1.2063	1.2099	1.2138	1.2165	1.2194	(40)
HLP (average)												1.2151	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4320 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.0738	27.6568	27.0697	25.9871	25.1765	24.2777	23.7922	24.3752	25.0100	25.9718	27.0767	27.9789	(42b)

Hot water usage for other uses

39.5361	38.0984	36.6608	35.2231	33.7854	32.3477	32.3477	33.7854	35.2231	36.6608	38.0984	39.5361	(42c)

Average daily hot water use (litres/day) 61.9707 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.6099	65.7553	63.7305	61.2102	58.9619	56.6254	56.1399	58.1606	60.2331	62.6326	65.1751	67.5150	(44)
Energy conte	107.0775	93.6346	97.9514	83.7937	79.3741	69.6276	67.8964	72.0150	74.2734	84.9918	92.8539	105.7121	(45)
Energy content (annual)											Total = Sum(45)m =	1029.2015	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

91.0159	79.5894	83.2587	71.2247	67.4680	59.1834	57.7119	61.2127	63.1324	72.2430	78.9258	89.8553	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

91.0159	79.5894	83.2587	71.2247	67.4680	59.1834	57.7119	61.2127	63.1324	72.2430	78.9258	89.8553	(64)
									Total per year (kWh/year) = Sum(64)m =		874.8213	(64)
12Total per year (kWh/year)											875	(64)

Electric shower(s)

52.0512	46.3781	50.6431	48.3281	49.2349	46.9654	48.5309	49.2349	48.3281	50.6431	49.6908	52.0512	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							592.0798	(64a)

Heat gains from water heating, kWh/month

35.7668	31.4919	33.4754	29.8882	29.1757	26.5372	26.5607	27.6119	27.8651	30.7215	32.1541	35.4766	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9903	120.6678	108.9903	112.6233	108.9903	112.6233	108.9903	108.9903	112.6233	108.9903	112.6233	108.9903	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.0854	218.3277	212.6772	200.6479	185.4632	171.1916	161.6574	159.4151	165.0656	177.0948	192.2796	206.5511	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	(71)
Water heating gains (Table 5)	48.0736	46.8629	44.9939	41.5114	39.2147	36.8572	35.6999	37.1128	38.7016	41.2924	44.6585	47.6837	(72)
Total internal gains	432.6293	445.3384	426.1413	414.2626	393.1481	380.1521	365.8275	364.9981	375.8704	386.8575	409.0414	422.7050	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Northeast	16.8300	11.2829	0.3100	0.0000	0.7700	45.3272	(75)
Northwest	2.1800	11.2829	0.3100	0.0000	0.7700	5.8713	(81)

Solar gains	102.1522	191.0090	306.5181	455.5045	579.3109	605.5200	571.1355	474.1229	357.3789	223.2850	125.4518	85.4170	(83)
Total gains	534.7815	636.3474	732.6594	869.7670	972.4591	985.6721	936.9630	839.1211	733.2493	610.1425	534.4932	508.1221	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.0902	57.1635	57.2354	57.5759	57.6401	57.9406	57.9406	57.9966	57.8245	57.6401	57.5104	57.3755	
alpha	4.8060	4.8109	4.8157	4.8384	4.8427	4.8627	4.8627	4.8664	4.8550	4.8427	4.8340	4.8250	
util living area	0.9966	0.9917	0.9778	0.9222	0.7877	0.5912	0.4398	0.5081	0.7790	0.9608	0.9926	0.9973	(86)
MIT	19.5630	19.7742	20.0966	20.5288	20.8399	20.9687	20.9939	20.9882	20.8879	20.4578	19.9319	19.5242	(87)
Th 2	19.8997	19.9009	19.9021	19.9079	19.9090	19.9140	19.9140	19.9149	19.9121	19.9090	19.9068	19.9045	(88)
util rest of house	0.9954	0.9889	0.9701	0.8962	0.7276	0.5008	0.3338	0.3936	0.6944	0.9423	0.9896	0.9964	(89)
MIT 2	18.6036	18.8142	19.1324	19.5461	19.8099	19.9012	19.9126	19.9119	19.8553	19.4911	18.9765	18.5687	(90)
Living area fraction										fLA = Living area / (4) =		0.3938	(91)
MIT	18.9815	19.1922	19.5121	19.9331	20.2155	20.3216	20.3385	20.3358	20.2619	19.8718	19.3528	18.9450	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9815	19.1922	19.5121	19.9331	20.2155	20.3216	20.3385	20.3358	20.2619	19.8718	19.3528	18.9450	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9941	0.9865	0.9667	0.8969	0.7457	0.5357	0.3757	0.4389	0.7240	0.9416	0.9875	0.9953	(94)
Useful gains	531.6328	627.7700	708.2263	780.0777	725.1936	528.0303	352.0158	368.2814	530.8852	574.4820	527.8175	505.7530	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1410.7514	1371.5920	1247.1718	1051.2338	810.4590	541.7229	353.9591	372.2837	584.5874	882.4358	1168.7752	1409.8093	(97)
Space heating kWh	654.0642	499.8484	400.9755	195.2324	63.4375	0.0000	0.0000	0.0000	0.0000	229.1176	461.4895	672.6180	(98a)
Space heating requirement - total per year (kWh/year)												3176.7830	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	654.0642	499.8484	400.9755	195.2324	63.4375	0.0000	0.0000	0.0000	0.0000	229.1176	461.4895	672.6180	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3176.7830	
Space heating per m2											(98c) / (4) =	40.5150	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	889.9958	700.6350	718.8763	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9068	0.9496	0.9204	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	807.0857	665.3263	661.6615	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1110.3179	1055.5087	943.2732	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	218.3272	290.2957	209.5191	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	54.5818	72.5739	52.3798	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												179.5355	(107)
Energy for space heating												40.5150	(99)
Energy for space cooling												2.2897	(108)
Total												42.8047	(109)
Fabric Energy Efficiency (DFEE)												42.8	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.4100	(1b)	x 2.5500	(2b) =	199.9455	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		199.9455	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1500	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3400	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4335	0.4250	0.4165	0.3740	0.3655	0.3230	0.3230	0.3145	0.3400	0.3655	0.3825	0.3995	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5940	0.5903	0.5868	0.5700	0.5668	0.5522	0.5522	0.5495	0.5578	0.5668	0.5732	0.5798	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.5400	1.1450	20.0840			(27)
Brickwork	89.1300	17.5400	71.5900	0.1800	12.8862			(29a)
Communal Wall	15.8200	2.0600	13.7600	0.1800	2.4768			(29a)
Lift Shaft	6.1200		6.1200	0.1800	1.1016			(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6086			(33)
Main dwelling								
Party Wall 1			11.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	251.8686	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.1500	0.0700	5.1205
E16 Corner (normal)	17.1100	0.0900	1.5399
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0900	-0.7695
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6000	0.0200	0.0720
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E1 Steel lintel with perforated steel base plate	11.2000	0.0500	0.5600
E4 Jamb	37.6900	0.0500	1.8845
E5 Ground floor (normal)	42.1100	0.1600	6.7376

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	15.4870	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 54.0956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1920	38.9512	38.7152	37.6066	37.3992	36.4336	36.4336	36.2548	36.8055	37.3992	37.8188	38.2575	(38)
Heat transfer coeff	93.2876	93.0468	92.8108	91.7022	91.4948	90.5292	90.5292	90.3504	90.9011	91.4948	91.9144	92.3530	(39)
Average = Sum(39)m / 12 =												91.7012	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1897	1.1867	1.1837	1.1695	1.1669	1.1546	1.1546	1.1523	1.1593	1.1669	1.1722	1.1778	(40)
HLP (average)												1.1695	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4320	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.0738	27.6568	27.0697	25.9871	25.1765	24.2777	23.7922	24.3752	25.0100	25.9718	27.0767	27.9789	(42b)

Hot water usage for other uses

39.5361	38.0984	36.6608	35.2231	33.7854	32.3477	32.3477	33.7854	35.2231	36.6608	38.0984	39.5361	(42c)

Average daily hot water use (litres/day)	61.9707 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	67.6099	65.7553	63.7305	61.2102	58.9619	56.6254	56.1399	58.1606	60.2331	62.6326	65.1751	67.5150	(44)
Energy conte	107.0775	93.6346	97.9514	83.7937	79.3741	69.6276	67.8964	72.0150	74.2734	84.9918	92.8539	105.7121	(45)
Energy content (annual)										Total = Sum(45)m =		1029.2015	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	91.0159	79.5894	83.2587	71.2247	67.4680	59.1834	57.7119	61.2127	63.1324	72.2430	78.9258	89.8553	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	91.0159	79.5894	83.2587	71.2247	67.4680	59.1834	57.7119	61.2127	63.1324	72.2430	78.9258	89.8553	(64)
										Total per year (kWh/year) = Sum(64)m =		874.8213	(64)
12Total per year (kWh/year)												875	(64)
Electric shower(s)													
	52.0512	46.3781	50.6431	48.3281	49.2349	46.9654	48.5309	49.2349	48.3281	50.6431	49.6908	52.0512	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		592.0798	(64a)
Heat gains from water heating, kWh/month													
	35.7668	31.4919	33.4754	29.8882	29.1757	26.5372	26.5607	27.6119	27.8651	30.7215	32.1541	35.4766	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	108.9837	120.6605	108.9837	112.6165	108.9837	112.6165	108.9837	108.9837	112.6165	108.9837	112.6165	108.9837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	216.0854	218.3277	212.6772	200.6479	185.4632	171.1916	161.6574	159.4151	165.0656	177.0948	192.2796	206.5511	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	(71)
Water heating gains (Table 5)													
	48.0736	46.8629	44.9939	41.5114	39.2147	36.8572	35.6999	37.1128	38.7016	41.2924	44.6585	47.6837	(72)
Total internal gains													
	432.6227	445.3311	426.1347	414.2558	393.1415	380.1453	365.8209	364.9916	375.8636	386.8509	409.0346	422.6985	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	12.0700	11.2829	0.6300	0.7000	0.7700	41.6199	(75)
Southeast	3.9100	36.7938	0.6300	0.7000	0.7700	43.9667	(77)
Northwest	1.5600	11.2829	0.6300	0.7000	0.7700	5.3792	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	90.9658	170.5596	274.8334	410.0355	522.7137	546.8387	515.5981	427.2690	320.9808	199.6851	111.7990	76.0082	(83)
Total gains	523.5885	615.8907	700.9681	824.2913	915.8553	926.9841	881.4190	792.2605	696.8445	586.5360	520.8336	498.7066	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.8057	58.9578	59.1078	59.8223	59.9580	60.5975	60.5975	60.7174	60.3495	59.9580	59.6842	59.4007	
alpha	4.9204	4.9305	4.9405	4.9882	4.9972	5.0398	5.0398	5.0478	5.0233	4.9972	4.9789	4.9600	
util living area													
	0.9969	0.9926	0.9805	0.9298	0.8012	0.6017	0.4474	0.5148	0.7872	0.9638	0.9932	0.9976	(86)
MIT	19.6021	19.8028	20.1105	20.5352	20.8413	20.9707	20.9945	20.9894	20.8933	20.4767	19.9708	19.5746	(87)
Th 2	19.9282	19.9307	19.9331	19.9445	19.9466	19.9565	19.9565	19.9584	19.9527	19.9466	19.9423	19.9378	(88)
util rest of house													
	0.9958	0.9901	0.9737	0.9060	0.7436	0.5134	0.3437	0.4032	0.7055	0.9467	0.9904	0.9967	(89)
MIT 2	18.6645	18.8657	19.1709	19.5842	19.8471	19.9443	19.9553	19.9556	19.8979	19.5403	19.0427	18.6445	(90)
Living area fraction										fLA = Living area / (4) =		0.3938	(91)
MIT	19.0338	19.2348	19.5410	19.9587	20.2386	20.3485	20.3646	20.3628	20.2899	19.9091	19.4082	19.0108	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0338	19.2348	19.5410	19.9587	20.2386	20.3485	20.3646	20.3628	20.2899	19.9091	19.4082	19.0108	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9946	0.9880	0.9705	0.9064	0.7608	0.5476	0.3847	0.4474	0.7341	0.9460	0.9885	0.9957	(94)
Useful gains	520.7714	608.4722	680.3069	747.1003	696.8170	507.5759	339.0574	354.4471	511.5799	554.8398	514.8674	496.5759	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1374.4761	1333.8061	1210.3410	1014.1101	781.2392	520.4075	340.8023	358.0376	562.6697	851.7293	1131.3011	1367.8239	(97)
Space heating kWh													
	635.1563	487.4244	394.3454	192.2471	62.8101	0.0000	0.0000	0.0000	0.0000	220.8858	443.8323	648.2086	(98a)
Space heating requirement - total per year (kWh/year)												3084.9099	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	635.1563	487.4244	394.3454	192.2471	62.8101	0.0000	0.0000	0.0000	0.0000	220.8858	443.8323	648.2086	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3084.9099	
Space heating per m2											(98c) / (4) =	39.3433	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	850.9745	669.9161	686.6630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9063	0.9502	0.9217	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	771.2463	636.5726	632.8636	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1041.7289	990.5942	888.5080	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	194.7474	263.3921	190.1995	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	48.6869	65.8480	47.5499	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												162.0848	(107)
Energy for space heating												39.3433	(99)
Energy for space cooling												2.0671	(108)
Total												41.4105	(109)
Fabric Energy Efficiency (TFEE)												41.4	(109)

Full SAP Calculation Printout

Plot Reference	P-02	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-02
Plot Address	Flat 2, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	77 C	**DER**	5.96	**TER**	14.01
Environmental	95 A	**% DER < TER**			57.46
CO_2 Emissions (t/year)	0.38	**DFEE**	42.92	**TFEE**	41.53
Compliance Check	See BREL	**% DFEE < TFEE**			-3.34
% DPER < TPER	17.29	**DPER**	61.40	**TPER**	74.24

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		78.4100	(1b)	x 2.5500	(2b) =	199.9455	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4100						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.9455	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.7200 (17)
Infiltration rate			0.1360 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1156 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1474	0.1445	0.1416	0.1272	0.1243	0.1098	0.1098	0.1069	0.1156	0.1243	0.1300	0.1358	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		71.2000 (23c)

Effective ac	0.2914	0.2885	0.2856	0.2712	0.2683	0.2538	0.2538	0.2509	0.2596	0.2683	0.2740	0.2798	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	89.1300	24.4600	64.6700	0.2100	13.5807	110.0000	7113.6997	(29a)
Communal Wall	15.8200	2.0600	13.7600	0.2200	3.0272	110.0000	1513.6000	(29a)
Lift Shaft	6.1200		6.1200	0.1600	0.9792	110.0000	673.2000	(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.7910			(33)
Main dwelling								
Party Wall 1			11.0000	0.0000	0.0000	110.0000	1210.0000	(32)
Party Floor 1			78.4100			70.0000	5488.7000	(32d)
Party Ceiling 1			78.4100			30.0000	2352.3000	(32b)
Internal Wall 1			155.2800			9.0000	1397.5200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19749.0196 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 251.8686 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.1500	0.0380	2.7797
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6000	0.3300	1.1880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E1 Steel lintel with perforated steel base plate	11.2000	0.0500	0.5600
E4 Jamb	37.6900	0.0160	0.6030
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1383 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.9293 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.2265	19.0358	18.8451	17.8917	17.7010	16.7476	16.7476	16.5569	17.1289	17.7010	18.0824	18.4637	(38)
Heat transfer coeff	79.1558	78.9651	78.7744	77.8210	77.6303	76.6769	76.6769	76.4862	77.0582	77.6303	78.0117	78.3930	(39)
Average = Sum(39)m / 12 =												77.7733	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0095	1.0071	1.0046	0.9925	0.9901	0.9779	0.9779	0.9755	0.9828	0.9901	0.9949	0.9998	(40)
HLP (average)												0.9919	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4320 (42)
Hot water usage for mixer showers

64.9963	64.0196	62.5962	59.8729	57.8632	55.6219	54.3480	55.7606	57.3090	59.7154	62.4972	64.7473	(42a)

Hot water usage for baths

28.0738	27.6568	27.0697	25.9871	25.1765	24.2777	23.7922	24.3752	25.0100	25.9718	27.0767	27.9789	(42b)

Hot water usage for other uses

39.5361	38.0984	36.6608	35.2231	33.7854	32.3477	32.3477	33.7854	35.2231	36.6608	38.0984	39.5361	(42c)

Average daily hot water use (litres/day) 121.8952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.6062	129.7748	126.3267	121.0831	116.8251	112.2474	110.4879	113.9212	117.5421	122.3480	127.6723	132.2623	(44)
Energy conte	210.0158	184.7977	194.1594	165.7568	157.2691	138.0212	133.6256	141.0582	144.9412	166.0251	181.8927	207.0908	(45)
Energy content (annual)										Total = Sum(45)m =		2024.6535	
Distribution loss (46)m = 0.15 x (45)m	31.5024	27.7196	29.1239	24.8635	23.5904	20.7032	20.0438	21.1587	21.7412	24.9038	27.2839	31.0636	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)
										Total per year (kWh/year) = Sum(64)m =		2341.9845	(64)
12Total per year (kWh/year)												2342	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.8303	61.4452	64.5580	55.1141	52.2920	45.8921	44.4305	46.9019	48.1929	55.2033	60.4793	68.8577	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9903	120.6678	108.9903	112.6233	108.9903	112.6233	108.9903	108.9903	112.6233	108.9903	112.6233	108.9903	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.0854	218.3277	212.6772	200.6479	185.4632	171.1916	161.6574	159.4151	165.0656	177.0948	192.2796	206.5511	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	(71)
Water heating gains (Table 5)	93.8579	91.4363	86.7715	76.5474	70.2849	63.7390	59.7184	63.0401	66.9347	74.1980	83.9990	92.5507	(72)
Total internal gains	478.4135	489.9118	467.9189	449.2986	424.2183	407.0339	389.8461	390.9255	404.1035	419.7631	448.3819	467.5720	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Northeast	16.8300	11.2829	0.3100	0.0000	0.7700	45.3272	(75)

Northwest				2.1800		11.2829		0.3100		0.0000		0.7700	5.8713 (81)
Solar gains	102.1522	191.0090	306.5181	455.5045	579.3109	605.5200	571.1355	474.1229	357.3789	223.2850	125.4518	85.4170 (83)	
Total gains	580.5657	680.9208	774.4370	904.8031	1003.5293	1012.5538	960.9815	865.0484	761.4824	643.0481	573.8337	552.9891 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.3043	69.4717	69.6398	70.4931	70.6662	71.5449	71.5449	71.7233	71.1908	70.6662	70.3207	69.9786	
alpha	5.6203	5.6314	5.6427	5.6995	5.7111	5.7697	5.7697	5.7816	5.7461	5.7111	5.6880	5.6652	
util living area	0.9945	0.9860	0.9611	0.8672	0.6849	0.4808	0.3505	0.4054	0.6689	0.9291	0.9872	0.9957	(86)
MIT	19.9617	20.1629	20.4446	20.7803	20.9514	20.9945	20.9993	20.9984	20.9687	20.7062	20.2758	19.9293	(87)
Th 2	20.0754	20.0774	20.0795	20.0896	20.0916	20.1018	20.1018	20.1038	20.0977	20.0916	20.0876	20.0835	(88)
util rest of house	0.9927	0.9817	0.9495	0.8340	0.6287	0.4151	0.2793	0.3271	0.5929	0.9023	0.9825	0.9944	(89)
MIT 2	18.8722	19.1285	19.4805	19.8810	20.0548	20.0990	20.1016	20.1033	20.0785	19.8104	19.2812	18.8371	(90)
Living area fraction									fLA = Living area / (4) =			0.3938	(91)
MIT	19.3013	19.5359	19.8602	20.2352	20.4079	20.4517	20.4551	20.4558	20.4291	20.1632	19.6729	19.2672	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3013	19.5359	19.8602	20.2352	20.4079	20.4517	20.4551	20.4558	20.4291	20.1632	19.6729	19.2672	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9785	0.9462	0.8397	0.6488	0.4409	0.3074	0.3580	0.6217	0.9048	0.9798	0.9927	(94)
Useful gains	575.2003	666.2622	732.7666	759.7826	651.1381	446.3954	295.3701	309.6828	473.4496	581.8170	562.2254	548.9709	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1187.4371	1155.7240	1052.4415	882.1133	675.9985	448.6864	295.5976	310.2127	487.7084	742.3942	980.8347	1181.1647	(97)
Space heating kWh	455.5042	328.9184	237.8381	88.0781	18.4962	0.0000	0.0000	0.0000	0.0000	119.4694	301.3986	470.3522	(98a)
Space heating requirement - total per year (kWh/year)												2020.0552	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	455.5042	328.9184	237.8381	88.0781	18.4962	0.0000	0.0000	0.0000	0.0000	119.4694	301.3986	470.3522	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2020.0552	
Space heating per m2										(98c) / (4) =		25.7627	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.5042	328.9184	237.8381	88.0781	18.4962	0.0000	0.0000	0.0000	0.0000	119.4694	301.3986	470.3522	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	455.5042	328.9184	237.8381	88.0781	18.4962	0.0000	0.0000	0.0000	0.0000	119.4694	301.3986	470.3522	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	73.0208	64.4462	68.1347	59.1146	56.7671	50.5680	49.4814	51.7717	52.7004	59.4652	64.0869	72.1195	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.9844	12.6311	13.9844	13.5333	13.9844	13.5333	13.9844	13.9844	13.5333	13.9844	13.5333	13.9844	(231)
Lighting	22.1831	17.7961	16.0235	11.7395	9.0679	7.4086	8.2720	10.7523	13.9662	18.3244	20.6974	22.7997	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2020.0552	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	324.5200	
Water heating fuel used	721.6765	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	164.6551	(230a)
Total electricity for the above, kWh/year	164.6551	(231)
Electricity for lighting (calculated in Appendix L)	179.0307	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3085.4176	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2020.0552	0.1568	316.7265	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	721.6765	0.1412	101.8934	(264)
Space and water heating			418.6198	(265)
Pumps, fans and electric keep-hot	164.6551	0.1387	22.8397	(267)
Energy for lighting	179.0307	0.1443	25.8397	(268)
Total CO2, kg/year			467.2992	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.9600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2020.0552	1.5804	3192.5842	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	721.6765	1.5221	1098.4516	(278)
Space and water heating			4291.0358	(279)
Pumps, fans and electric keep-hot	164.6551	1.5128	249.0903	(281)
Energy for lighting	179.0307	1.5338	274.6033	(282)
Total Primary energy kWh/year			4814.7294	(286)
Dwelling Primary energy Rate (DPER)			61.4000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.4100	(1b)	x 2.5500	(2b) =	199.9455	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		199.9455	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1500	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4000	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3400	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4335	0.4250	0.4165	0.3740	0.3655	0.3230	0.3230	0.3145	0.3400	0.3655	0.3825	0.3995	(22b)

Effective ac	0.5940	0.5903	0.5868	0.5700	0.5668	0.5522	0.5522	0.5495	0.5578	0.5668	0.5732	0.5798	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.5400	1.1450	20.0840			(27)
Brickwork	89.1300	17.5400	71.5900	0.1800	12.8862			(29a)
Communal Wall	15.8200	2.0600	13.7600	0.1800	2.4768			(29a)
Lift Shaft	6.1200		6.1200	0.1800	1.1016			(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6086			(33)
Main dwelling								
Party Wall 1			11.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	251.8686	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.1500	0.0700	5.1205
E16 Corner (normal)	17.1100	0.0900	1.5399
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0900	-0.7695
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6000	0.0200	0.0720
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E1 Steel lintel with perforated steel base plate	11.2000	0.0500	0.5600
E4 Jamb	37.6900	0.0500	1.8845
E5 Ground floor (normal)	42.1100	0.1600	6.7376

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.4870	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	54.0956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.1920	38.9512	38.7152	37.6066	37.3992	36.4336	36.4336	36.2548	36.8055	37.3992	37.8188	38.2575	(38)
Heat transfer coeff	93.2876	93.0468	92.8108	91.7022	91.4948	90.5292	90.5292	90.3504	90.9011	91.4948	91.9144	92.3530	(39)
Average = Sum(39)m / 12 =												91.7012	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1897	1.1867	1.1837	1.1695	1.1669	1.1546	1.1546	1.1523	1.1593	1.1669	1.1722	1.1778	(40)
HLP (average)												1.1695	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4320	(42)
Hot water usage for mixer showers	64.9963	64.0196	62.5962	59.8729	57.8632	55.6219	54.3480	55.7606	57.3090	59.7154	62.4972	64.7473	(42a)
Hot water usage for baths	28.0738	27.6568	27.0697	25.9871	25.1765	24.2777	23.7922	24.3752	25.0100	25.9718	27.0767	27.9789	(42b)
Hot water usage for other uses	39.5361	38.0984	36.6608	35.2231	33.7854	32.3477	32.3477	33.7854	35.2231	36.6608	38.0984	39.5361	(42c)
Average daily hot water use (litres/day)												121.8952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.6062	129.7748	126.3267	121.0831	116.8251	112.2474	110.4879	113.9212	117.5421	122.3480	127.6723	132.2623	(44)
Energy conte	210.0158	184.7977	194.1594	165.7568	157.2691	138.0212	133.6256	141.0582	144.9412	166.0251	181.8927	207.0908	(45)
Energy content (annual)										Total = Sum(45)m =		2024.6535	
Distribution loss (46)m = 0.15 x (45)m	31.5024	27.7196	29.1239	24.8635	23.5904	20.7032	20.0438	21.1587	21.7412	24.9038	27.2839	31.0636	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.6107	226.8834	240.7543	210.8486	203.8640	183.1131	180.2205	187.6532	190.0330	212.6200	226.9845	253.6857	(62)
WWHRS	-29.7136	-26.2790	-27.5178	-22.7858	-21.2356	-18.1714	-17.0328	-18.1127	-18.8009	-22.1642	-25.1093	-29.1634	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	226.8971	200.6044	213.2365	188.0628	182.6284	164.9416	163.1877	169.5404	171.2322	190.4558	201.8752	224.5223	(64)
										Total per year (kWh/year) = Sum(64)m =		2297.1845	(64)
12Total per year (kWh/year)												2297	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	107.1062	95.1138	101.8339	91.1876	89.5679	81.9655	81.7064	84.1778	84.2664	92.4793	96.5528	106.1336	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	121.6000	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9837	120.6605	108.9837	112.6165	108.9837	112.6165	108.9837	108.9837	112.6165	108.9837	112.6165	108.9837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.0854	218.3277	212.6772	200.6479	185.4632	171.1916	161.6574	159.4151	165.0656	177.0948	192.2796	206.5511	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	35.1600	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	(71)
Water heating gains (Table 5)													
	143.9599	141.5384	136.8736	126.6494	120.3869	113.8410	109.8205	113.1422	117.0367	124.3001	134.1011	142.6527	(72)
Total internal gains													
	531.5090	543.0066	521.0144	502.3938	477.3138	457.1291	439.9415	441.0210	454.1988	472.8586	501.4772	520.6675	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	12.0700	11.2829	0.6300	0.7000	0.7700	41.6199	(75)
Southeast	3.9100	36.7938	0.6300	0.7000	0.7700	43.9667	(77)
Northwest	1.5600	11.2829	0.6300	0.7000	0.7700	5.3792	(81)

Solar gains	90.9658	170.5596	274.8334	410.0355	522.7137	546.8387	515.5981	427.2690	320.9808	199.6851	111.7990	76.0082	(83)
Total gains	622.4748	713.5662	795.8478	912.4294	1000.0275	1003.9679	955.5396	868.2899	775.1796	672.5437	613.2762	596.6757	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.8057	58.9578	59.1078	59.8223	59.9580	60.5975	60.5975	60.7174	60.3495	59.9580	59.6842	59.4007	
alpha	4.9204	4.9305	4.9405	4.9882	4.9972	5.0398	5.0398	5.0478	5.0233	4.9972	4.9789	4.9600	
util living area													
	0.9934	0.9863	0.9681	0.9030	0.7596	0.5612	0.4139	0.4725	0.7352	0.9409	0.9864	0.9946	(86)
MIT	19.7322	19.9276	20.2228	20.6131	20.8763	20.9784	20.9961	20.9928	20.9222	20.5681	20.0894	19.7044	(87)
Th 2	19.9282	19.9307	19.9331	19.9445	19.9466	19.9565	19.9565	19.9584	19.9527	19.9466	19.9423	19.9378	(88)
util rest of house													
	0.9912	0.9819	0.9577	0.8733	0.6989	0.4765	0.3173	0.3687	0.6501	0.9158	0.9812	0.9928	(89)
MIT 2	18.4722	18.7216	19.0931	19.5691	19.8499	19.9452	19.9554	19.9560	19.9038	19.5306	18.9372	18.4437	(90)
Living area fraction									fLA = Living area / (4) =			0.3938	(91)
MIT	18.9684	19.1966	19.5381	19.9802	20.2542	20.3521	20.3653	20.3643	20.3049	19.9392	19.3910	18.9402	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9684	19.1966	19.5381	19.9802	20.2542	20.3521	20.3653	20.3643	20.3049	19.9392	19.3910	18.9402	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9886	0.9780	0.9529	0.8744	0.7177	0.5094	0.3555	0.4097	0.6806	0.9156	0.9776	0.9905	(94)
Useful gains	615.3704	697.8335	758.3685	797.8567	717.7446	511.3909	339.6491	355.7573	527.5564	615.7493	599.5315	591.0308	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1368.3806	1330.2502	1210.0719	1016.0828	782.6607	520.7341	340.8672	358.1779	564.0292	854.4848	1129.7148	1361.3016	(97)
Space heating kWh													
	560.2396	424.9840	336.0673	157.1228	48.2976	0.0000	0.0000	0.0000	0.0000	177.6192	381.7319	573.0815	(98a)
Space heating requirement - total per year (kWh/year)												2659.1439	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	560.2396	424.9840	336.0673	157.1228	48.2976	0.0000	0.0000	0.0000	0.0000	177.6192	381.7319	573.0815	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2659.1439	
Space heating per m2											(98c) / (4) =	33.9133	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	560.2396	424.9840	336.0673	157.1228	48.2976	0.0000	0.0000	0.0000	0.0000	177.6192	381.7319	573.0815	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	606.9768	460.4377	364.1032	170.2306	52.3267	0.0000	0.0000	0.0000	0.0000	192.4368	413.5774	620.8901	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	226.8971	200.6044	213.2365	188.0628	182.6284	164.9416	163.1877	169.5404	171.2322	190.4558	201.8752	224.5223	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0040	85.7006	85.0753	83.6595	81.5282	79.8000	79.8000	79.8000	79.8000	83.9036	85.4658	86.0676	(217)
Fuel for water heating, kWh/month													
	263.8216	234.0758	250.6445	224.7955	224.0064	206.6938	204.4958	212.4567	214.5767	226.9937	236.2059	260.8676	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.6447	18.1664	16.3568	11.9837	9.2566	7.5627	8.4441	10.9760	14.2568	18.7056	21.1280	23.2740	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.9153	-30.9376	-46.6320	-55.0627	-61.6803	-58.4105	-57.6904	-53.3129	-46.0026	-36.5181	-23.5012	-17.9167	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-7.7866	-16.7170	-33.8635	-51.8107	-69.4476	-70.1296	-69.3120	-58.2602	-42.1417	-24.2237	-10.4965	-6.1332	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2880.9793	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2759.6338	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	182.7554	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-968.9027	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4940.4657	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2880.9793	0.2100	605.0056	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2759.6338	0.2100	579.5231	(264)
Space and water heating			1184.5288	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	182.7554	0.1443	26.3772	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-508.5804	0.1336	-67.9415	
PV Unit electricity exported	-460.3223	0.1254	-57.7035	
Total			-125.6451	(269)
Total CO2, kg/year			1097.1902	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2880.9793	1.1300	3255.5066	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2759.6338	1.1300	3118.3862	(278)
Space and water heating			6373.8928	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	182.7554	1.5338	280.3163	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-508.5804	1.4937	-759.6520	
PV Unit electricity exported	-460.3223	0.4601	-211.7996	
Total			-971.4516	(283)
Total Primary energy kWh/year			5812.8582	(286)
Target Primary Energy Rate (TPER)			74.1300	(287)

Full SAP Calculation Printout

Plot Reference	P-02	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-02
Plot Address	Flat 2, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	77 C	**DER**	5.96	**TER**	14.01
Environmental	95 A	**% DER < TER**			57.46
CO_2 Emissions (t/year)	0.38	**DFEE**	42.92	**TFEE**	41.53
Compliance Check	See BREL	**% DFEE < TFEE**			-3.34
% DPER < TPER	17.29	**DPER**	61.40	**TPER**	74.24

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.4100	(1b)	x 2.5500	(2b) =	199.9455	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4100					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.9455	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7200 (17)
Infiltration rate		0.1360 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1156 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1474	0.1445	0.1416	0.1272	0.1243	0.1098	0.1098	0.1069	0.1156	0.1243	0.1300	0.1358	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		71.2000 (23c)

Effective ac	0.2914	0.2885	0.2856	0.2712	0.2683	0.2538	0.2538	0.2509	0.2596	0.2683	0.2740	0.2798	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	89.1300	24.4600	64.6700	0.2100	13.5807	110.0000	7113.6997	(29a)
Communal Wall	15.8200	2.0600	13.7600	0.2200	3.0272	110.0000	1513.6000	(29a)
Lift Shaft	6.1200		6.1200	0.1600	0.9792	110.0000	673.2000	(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.7910			(33)
Main dwelling								
Party Wall 1			11.0000	0.0000	0.0000	110.0000	1210.0000	(32)
Party Floor 1			78.4100			70.0000	5488.7000	(32d)
Party Ceiling 1			78.4100			30.0000	2352.3000	(32b)
Internal Wall 1			155.2800			9.0000	1397.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19749.0196 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 251.8686 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.1500	0.0380	2.7797
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6000	0.3300	1.1880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E1 Steel lintel with perforated steel base plate	11.2000	0.0500	0.5600
E4 Jamb	37.6900	0.0160	0.6030
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1383 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.9293 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.2265	19.0358	18.8451	17.8917	17.7010	16.7476	16.7476	16.5569	17.1289	17.7010	18.0824	18.4637	(38)
Heat transfer coeff	79.1558	78.9651	78.7744	77.8210	77.6303	76.6769	76.6769	76.4862	77.0582	77.6303	78.0117	78.3930	(39)

Average = Sum(39)m / 12 = 77.7733

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0095	1.0071	1.0046	0.9925	0.9901	0.9779	0.9779	0.9755	0.9828	0.9901	0.9949	0.9998	(40)
HLP (average)												0.9919	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4320 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	64.9963	64.0196	62.5962	59.8729	57.8632	55.6219	54.3480	55.7606	57.3090	59.7154	62.4972	64.7473	(42a)
Hot water usage for baths	28.0738	27.6568	27.0697	25.9871	25.1765	24.2777	23.7922	24.3752	25.0100	25.9718	27.0767	27.9789	(42b)
Hot water usage for other uses	39.5361	38.0984	36.6608	35.2231	33.7854	32.3477	32.3477	33.7854	35.2231	36.6608	38.0984	39.5361	(42c)

Average daily hot water use (litres/day) 121.8952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.6062	129.7748	126.3267	121.0831	116.8251	112.2474	110.4879	113.9212	117.5421	122.3480	127.6723	132.2623	(44)
Energy conte	210.0158	184.7977	194.1594	165.7568	157.2691	138.0212	133.6256	141.0582	144.9412	166.0251	181.8927	207.0908	(45)
Energy content (annual)										Total = Sum(45)m =		2024.6535	
Distribution loss (46)m = 0.15 x (45)m	31.5024	27.7196	29.1239	24.8635	23.5904	20.7032	20.0438	21.1587	21.7412	24.9038	27.2839	31.0636	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)
										Total per year (kWh/year) = Sum(64)m =		2341.9845	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.8303	61.4452	64.5580	55.1141	52.2920	45.8921	44.4305	46.9019	48.1929	55.2033	60.4793	68.8577	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3437	22.5100	18.3064	13.8591	10.3598	8.7462	9.4506	12.2842	16.4879	20.9351	24.4344	26.0480	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.5155	325.8622	317.4286	299.4745	276.8107	255.5099	241.2797	237.9330	246.3666	264.3206	286.9845	308.2853	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	(71)
Water heating gains (Table 5)	93.8579	91.4363	86.7715	76.5474	70.2849	63.7390	59.7184	63.0401	66.9347	74.1980	83.9990	92.5507	(72)
Total internal gains	542.3810	540.4725	523.1705	490.5450	458.1194	428.6591	411.1127	413.9213	430.4531	460.1178	496.0819	527.5479	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Northeast	16.8300	11.2829	0.3100	0.0000	0.7700	45.3272	(75)
Northwest	2.1800	11.2829	0.3100	0.0000	0.7700	5.8713	(81)

Solar gains	102.1522	191.0090	306.5181	455.5045	579.3109	605.5200	571.1355	474.1229	357.3789	223.2850	125.4518	85.4170	(83)
Total gains	644.5332	731.4816	829.6886	946.0495	1037.4304	1034.1790	982.2482	888.0443	787.8320	683.4028	621.5337	612.9650	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.3043	69.4717	69.6398	70.4931	70.6662	71.5449	71.5449	71.7233	71.1908	70.6662	70.3207	69.9786	
alpha	5.6203	5.6314	5.6427	5.6995	5.7111	5.7697	5.7697	5.7816	5.7461	5.7111	5.6880	5.6652	
util living area													
	0.9909	0.9806	0.9488	0.8487	0.6667	0.4711	0.3430	0.3951	0.6502	0.9120	0.9815	0.9929	(86)
MIT	20.0472	20.2270	20.5045	20.8060	20.9575	20.9951	20.9993	20.9986	20.9728	20.7423	20.3368	20.0103	(87)
Th 2	20.0754	20.0774	20.0795	20.0896	20.0916	20.1018	20.1018	20.1038	20.0977	20.0916	20.0876	20.0835	(88)
util rest of house													
	0.9881	0.9749	0.9344	0.8133	0.6108	0.4065	0.2732	0.3187	0.5750	0.8811	0.9751	0.9908	(89)
MIT 2	18.9805	19.2085	19.5520	19.9077	20.0597	20.0992	20.1016	20.1034	20.0812	19.8497	19.3570	18.9400	(90)
Living area fraction									fLA = Living area / (4) =			0.3938	(91)
MIT	19.4006	19.6096	19.9271	20.2614	20.4133	20.4520	20.4552	20.4559	20.4324	20.2012	19.7428	19.3615	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4006	19.6096	19.9271	20.2614	20.4133	20.4520	20.4552	20.4559	20.4324	20.2012	19.7428	19.3615	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9854	0.9713	0.9316	0.8205	0.6311	0.4319	0.3007	0.3488	0.6037	0.8853	0.9720	0.9885	(94)
Useful gains	635.1459	710.4710	772.9307	776.2341	654.7219	446.6546	295.3987	309.7602	475.6311	605.0051	604.1139	605.9085	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1195.2979	1161.5446	1057.7137	884.1585	676.4145	448.7161	295.6012	310.2221	487.9600	745.3454	986.2898	1188.5583	(97)
Space heating kWh													
	416.7530	303.1215	211.8785	77.7056	16.1393	0.0000	0.0000	0.0000	0.0000	104.4132	275.1667	433.4914	(98a)
Space heating requirement - total per year (kWh/year)												1838.6692	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	416.7530	303.1215	211.8785	77.7056	16.1393	0.0000	0.0000	0.0000	0.0000	104.4132	275.1667	433.4914	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1838.6692	
Space heating per m2											(98c) / (4) =	23.4494	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	416.7530	303.1215	211.8785	77.7056	16.1393	0.0000	0.0000	0.0000	0.0000	104.4132	275.1667	433.4914	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	416.7530	303.1215	211.8785	77.7056	16.1393	0.0000	0.0000	0.0000	0.0000	104.4132	275.1667	433.4914	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	73.0208	64.4462	68.1347	59.1146	56.7671	50.5680	49.4814	51.7717	52.7004	59.4652	64.0869	72.1195	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.9844	12.6311	13.9844	13.5333	13.9844	13.5333	13.9844	13.9844	13.5333	13.9844	13.5333	13.9844	(231)
Lighting	22.1831	17.7961	16.0235	11.7395	9.0679	7.4086	8.2720	10.7523	13.9662	18.3244	20.6974	22.7997	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1838.6692	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	721.6765	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	164.6551	(230a)
Total electricity for the above, kWh/year	164.6551	(231)
Electricity for lighting (calculated in Appendix L)	179.0307	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2904.0315	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1838.6692	16.4900	303.1965	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	721.6765	16.4900	119.0045	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	164.6551	16.4900	27.1516	(249)
Energy for lighting	179.0307	16.4900	29.5222	(250)
Additional standing charges			0.0000	(251)
Total energy cost			478.8748	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3969	(257)
SAP value		77.3558	
SAP rating (Section 12)		77	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1838.6692	0.1569	288.4993	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	721.6765	0.1412	101.8934	(264)
Space and water heating			390.3927	(265)
Pumps, fans and electric keep-hot	164.6551	0.1387	22.8397	(267)
Energy for lighting	179.0307	0.1443	25.8397	(268)
Total CO2, kg/year			439.0721	(272)
CO2 emissions per m2			5.6000	(273)
EI value			95.2325	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.4100	(1b) x	2.5500	(2b) =	199.9455	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		199.9455	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	2.7200	(17)
Infiltration rate	0.1360	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1156	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1243	0.1185	0.1185	0.1098	0.1127	0.0983	0.0983	0.0954	0.0983	0.1098	0.1069	0.1156	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	71.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2683	0.2625	0.2625	0.2538	0.2567	0.2423	0.2423	0.2394	0.2423	0.2538	0.2509	0.2596	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	89.1300	24.4600	64.6700	0.2100	13.5807	110.0000	7113.6997	(29a)
Communal Wall	15.8200	2.0600	13.7600	0.2200	3.0272	110.0000	1513.6000	(29a)
Lift Shaft	6.1200		6.1200	0.1600	0.9792	110.0000	673.2000	(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.7910			(33)
Main dwelling								
Party Wall 1			11.0000	0.0000	0.0000	110.0000	1210.0000	(32)
Party Floor 1			78.4100			70.0000	5488.7000	(32d)
Party Ceiling 1			78.4100			30.0000	2352.3000	(32b)
Internal Wall 1			155.2800			9.0000	1397.5200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	19749.0196	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	251.8686	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.1500	0.0380	2.7797
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6000	0.3300	1.1880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E1 Steel lintel with perforated steel base plate	11.2000	0.0500	0.5600
E4 Jamb	37.6900	0.0160	0.6030
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.1383	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	59.9293	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.7010	17.3196	17.3196	16.7476	16.9382	15.9848	15.9848	15.7941	15.9848	16.7476	16.5569	17.1289	(38)
Heat transfer coeff	77.6303	77.2489	77.2489	76.6769	76.8675	75.9141	75.9141	75.7234	75.9141	76.6769	76.4862	77.0582	(39)
Average = Sum(39)m / 12 =												76.6133	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9901	0.9852	0.9852	0.9779	0.9803	0.9682	0.9682	0.9657	0.9682	0.9779	0.9755	0.9828	(40)
HLP (average)												0.9771	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4320	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
64.9963	64.0196	62.5962	59.8729	57.8632	55.6219	54.3480	55.7606	57.3090	59.7154	62.4972	64.7473	(42a)

Hot water usage for baths

28.0738	27.6568	27.0697	25.9871	25.1765	24.2777	23.7922	24.3752	25.0100	25.9718	27.0767	27.9789	(42b)

Hot water usage for other uses

39.5361	38.0984	36.6608	35.2231	33.7854	32.3477	32.3477	33.7854	35.2231	36.6608	38.0984	39.5361	(42c)

Average daily hot water use (litres/day)	121.8952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.6062	129.7748	126.3267	121.0831	116.8251	112.2474	110.4879	113.9212	117.5421	122.3480	127.6723	132.2623	(44)
Energy conte	210.0158	184.7977	194.1594	165.7568	157.2691	138.0212	133.6256	141.0582	144.9412	166.0251	181.8927	207.0908	(45)
Energy content (annual)										Total = Sum(45)m =		2024.6535	
Distribution loss (46)m = 0.15 x (45)m	31.5024	27.7196	29.1239	24.8635	23.5904	20.7032	20.0438	21.1587	21.7412	24.9038	27.2839	31.0636	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422 (64)
Total per year (kWh/year) = Sum(64)m =												2341.9845 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)

Heat gains from water heating, kWh/month

	69.8303	61.4452	64.5580	55.1141	52.2920	45.8921	44.4305	46.9019	48.1929	55.2033	60.4793	68.8577 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	25.3437	22.5100	18.3064	13.8591	10.3598	8.7462	9.4506	12.2842	16.4879	20.9351	24.4344	26.0480 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	322.5155	325.8622	317.4286	299.4745	276.8107	255.5099	241.2797	237.9330	246.3666	264.3206	286.9845	308.2853 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240 (69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800 (71)

Water heating gains (Table 5)

	93.8579	91.4363	86.7715	76.5474	70.2849	63.7390	59.7184	63.0401	66.9347	74.1980	83.9990	92.5507 (72)

Total internal gains

	542.3810	540.4725	523.1705	490.5450	458.1194	428.6591	411.1127	413.9213	430.4531	460.1178	496.0819	527.5479 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
Northeast	16.8300	13.7804	0.3100	0.0000	0.7700	55.3604	(75)
Northwest	2.1800	13.7804	0.3100	0.0000	0.7700	7.1709	(81)

Solar gains	122.1616	200.5642	321.5614	487.2273	604.1786	667.7421	623.7565	530.9123	400.5240	252.2735	147.9919	102.6055 (83)
Total gains	664.5427	741.0368	844.7319	977.7723	1062.2980	1096.4012	1034.8691	944.8336	830.9771	712.3913	644.0738	630.1534 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6662	71.0151	71.0151	71.5449	71.3674	72.2638	72.2638	72.4457	72.2638	71.5449	71.7233	71.1908	
alpha	5.7111	5.7343	5.7343	5.7697	5.7578	5.8176	5.8176	5.8297	5.8176	5.7697	5.7816	5.7461	
util living area													
	0.9863	0.9732	0.9271	0.7873	0.5746	0.3594	0.2420	0.2724	0.5405	0.8616	0.9698	0.9892	(86)
MIT	20.1898	20.3545	20.6254	20.8859	20.9829	20.9991	20.9999	20.9999	20.9911	20.8392	20.4811	20.1565	(87)
Th 2	20.0916	20.0957	20.0957	20.1018	20.0998	20.1099	20.1099	20.1120	20.1099	20.1018	20.1038	20.0977	(88)
util rest of house													
	0.9821	0.9652	0.9071	0.7434	0.5151	0.2982	0.1768	0.2013	0.4638	0.8175	0.9592	0.9858	(89)
MIT 2	19.1736	19.3824	19.7101	20.0020	20.0885	20.1096	20.1099	20.1120	20.1055	19.9629	19.5491	19.1365	(90)
Living area fraction									fLA = Living area / (4) =			0.3938	(91)
MIT	19.5738	19.7653	20.0706	20.3501	20.4407	20.4599	20.4604	20.4616	20.4543	20.3080	19.9162	19.5382	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5738	19.7653	20.0706	20.3501	20.4407	20.4599	20.4604	20.4616	20.4543	20.3080	19.9162	19.5382	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9790	0.9617	0.9065	0.7561	0.5379	0.3223	0.2025	0.2293	0.4939	0.8286	0.9565	0.9831	(94)
Useful gains	650.6072	712.6243	765.7108	739.3172	571.4498	353.4185	209.5408	216.6620	410.4138	590.2947	616.0293	619.5019	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1123.6059	1086.5255	978.7879	801.2846	579.6348	353.7509	209.5562	216.6933	414.0555	675.3710	911.4240	1112.5814	(97)
Space heating kWh													
	351.9110	251.2616	158.5294	44.6165	6.0896	0.0000	0.0000	0.0000	0.0000	63.2968	212.6842	366.8512	(98a)
Space heating requirement - total per year (kWh/year)												1455.2403	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	351.9110	251.2616	158.5294	44.6165	6.0896	0.0000	0.0000	0.0000	0.0000	63.2968	212.6842	366.8512	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1455.2403	
Space heating per m2											(98c) / (4) =	18.5594	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	351.9110	251.2616	158.5294	44.6165	6.0896	0.0000	0.0000	0.0000	0.0000	63.2968	212.6842	366.8512	(98)

Space heating efficiency (main heating system 1)

100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)

351.9110	251.2616	158.5294	44.6165	6.0896	0.0000	0.0000	0.0000	0.0000	63.2968	212.6842	366.8512	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)

Efficiency of water heater 324.5200 (216)

(217)m 324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)

Fuel for water heating, kWh/month

73.0208	64.4462	68.1347	59.1146	56.7671	50.5680	49.4814	51.7717	52.7004	59.4652	64.0869	72.1195	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 13.9844	12.6311	13.9844	13.5333	13.9844	13.5333	13.9844	13.9844	13.5333	13.9844	13.5333	13.9844	(231)
Lighting 22.1831	17.7961	16.0235	11.7395	9.0679	7.4086	8.2720	10.7523	13.9662	18.3244	20.6974	22.7997	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1455.2403 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 721.6765 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)
mechanical ventilation fans (SFP = 0.6750) 164.6551 (230a)
Total electricity for the above, kWh/year 164.6551 (231)
Electricity for lighting (calculated in Appendix L) 179.0307 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2520.6026 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1455.2403	27.6700	402.6650	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	721.6765	27.6700	199.6879	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	164.6551	27.6700	45.5601	(249)
Energy for lighting	179.0307	27.6700	49.5378	(250)
Additional standing charges			0.0000	(251)
Total energy cost			697.4507	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1455.2403	0.1577	229.5228	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	721.6765	0.1412	101.8934	(264)
Space and water heating			331.4161	(265)
Pumps, fans and electric keep-hot	164.6551	0.1387	22.8397	(267)
Energy for lighting	179.0307	0.1443	25.8397	(268)
Total CO2, kg/year			380.0955	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1455.2403	1.5839	2304.9034	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	721.6765	1.5221	1098.4516	(278)
Space and water heating			3403.3550	(279)
Pumps, fans and electric keep-hot	164.6551	1.5128	249.0903	(281)
Energy for lighting	179.0307	1.5338	274.6033	(282)
Total Primary energy kWh/year			3927.0486	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 77
Current environmental impact rating: A 95

N	Solar water heating		Not applicable
U	Solar photovoltaic panels		Not applicable
V2	Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 77
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£697	£697	£0
Space heating	£448	£448	£0
Water heating	£200	£200	£0
Lighting	£50	£50	£0
Total cost of fuels	£697	£697	£0
Total cost of uses	£698	£698	£0
Delivered energy	32 kWh/m²	32 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	50 kWh/m²	50 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.4100 (1b)	x	2.5500 (2b)	=	199.9455	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.9455	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7200 (17)
Infiltration rate		0.1360 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1156 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1474	0.1445	0.1416	0.1272	0.1243	0.1098	0.1098	0.1069	0.1156	0.1243	0.1300	0.1358	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 71.2000 (23c)

Effective ac	0.2914	0.2885	0.2856	0.2712	0.2683	0.2538	0.2538	0.2509	0.2596	0.2683	0.2740	0.2798 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	89.1300	24.4600	64.6700	0.2100	13.5807	110.0000	7113.6997	(29a)
Communal Wall	15.8200	2.0600	13.7600	0.2200	3.0272	110.0000	1513.6000	(29a)
Lift Shaft	6.1200		6.1200	0.1600	0.9792	110.0000	673.2000	(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.7910			(33)
Main dwelling								
Party Wall 1			11.0000	0.0000	0.0000	110.0000	1210.0000	(32)
Party Floor 1			78.4100			70.0000	5488.7000	(32d)
Party Ceiling 1			78.4100			30.0000	2352.3000	(32b)
Internal Wall 1			155.2800			9.0000	1397.5200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19749.0196 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 251.8686 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.1500	0.0380	2.7797
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6000	0.3300	1.1880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E1 Steel lintel with perforated steel base plate	11.2000	0.0500	0.5600
E4 Jamb	37.6900	0.0160	0.6030
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1383 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.9293 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.2265	19.0358	18.8451	17.8917	17.7010	16.7476	16.7476	16.5569	17.1289	17.7010	18.0824	18.4637	(38)
Heat transfer coeff	79.1558	78.9651	78.7744	77.8210	77.6303	76.6769	76.6769	76.4862	77.0582	77.6303	78.0117	78.3930	(39)
Average = Sum(39)m / 12 =												77.7733	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0095	1.0071	1.0046	0.9925	0.9901	0.9779	0.9779	0.9755	0.9828	0.9901	0.9949	0.9998	(40)
HLP (average)												0.9919	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4320 (42)
Hot water usage for mixer showers

64.9963	64.0196	62.5962	59.8729	57.8632	55.6219	54.3480	55.7606	57.3090	59.7154	62.4972	64.7473	(42a)

Hot water usage for baths

28.0738	27.6568	27.0697	25.9871	25.1765	24.2777	23.7922	24.3752	25.0100	25.9718	27.0767	27.9789	(42b)

Hot water usage for other uses

39.5361	38.0984	36.6608	35.2231	33.7854	32.3477	32.3477	33.7854	35.2231	36.6608	38.0984	39.5361	(42c)

Average daily hot water use (litres/day) 121.8952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.6062	129.7748	126.3267	121.0831	116.8251	112.2474	110.4879	113.9212	117.5421	122.3480	127.6723	132.2623	(44)
Energy conte	210.0158	184.7977	194.1594	165.7568	157.2691	138.0212	133.6256	141.0582	144.9412	166.0251	181.8927	207.0908	(45)
Energy content (annual)										Total = Sum(45)m =		2024.6535	
Distribution loss (46)m = 0.15 x (45)m	31.5024	27.7196	29.1239	24.8635	23.5904	20.7032	20.0438	21.1587	21.7412	24.9038	27.2839	31.0636	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)
										Total per year (kWh/year) = Sum(64)m =		2341.9845	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.8303	61.4452	64.5580	55.1141	52.2920	45.8921	44.4305	46.9019	48.1929	55.2033	60.4793	68.8577	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
25.3437 22.5100 18.3064 13.8591 10.3598 8.7462 9.4506 12.2842 16.4879 20.9351 24.4344 26.0480 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
322.5155 325.8622 317.4286 299.4745 276.8107 255.5099 241.2797 237.9330 246.3666 264.3206 286.9845 308.2853 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.0240 52.0240 52.0240 52.0240 52.0240 52.0240 52.0240 52.0240 52.0240 52.0240 52.0240 52.0240 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-97.2800 -97.2800 -97.2800 -97.2800 -97.2800 -97.2800 -97.2800 -97.2800 -97.2800 -97.2800 -97.2800 -97.2800 (71)
Water heating gains (Table 5)
93.8579 91.4363 86.7715 76.5474 70.2849 63.7390 59.7184 63.0401 66.9347 74.1980 83.9990 92.5507 (72)
Total internal gains
542.3810 540.4725 523.1705 490.5450 458.1194 428.6591 411.1127 413.9213 430.4531 460.1178 496.0819 527.5479 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Northeast	16.8300	11.2829	0.3100	0.0000	0.7700	45.3272	(75)
Northwest	2.1800	11.2829	0.3100	0.0000	0.7700	5.8713	(81)

Solar gains 102.1522 191.0090 306.5181 455.5045 579.3109 605.5200 571.1355 474.1229 357.3789 223.2850 125.4518 85.4170 (83)
Total gains 644.5332 731.4816 829.6886 946.0495 1037.4304 1034.1790 982.2482 888.0443 787.8320 683.4028 621.5337 612.9650 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.3043	69.4717	69.6398	70.4931	70.6662	71.5449	71.5449	71.7233	71.1908	70.6662	70.3207	69.9786	
alpha	5.6203	5.6314	5.6427	5.6995	5.7111	5.7697	5.7697	5.7816	5.7461	5.7111	5.6880	5.6652	
util living area	0.9909	0.9806	0.9488	0.8487	0.6667	0.4711	0.3430	0.3951	0.6502	0.9120	0.9815	0.9929	(86)
MIT	20.0472	20.2270	20.5045	20.8060	20.9575	20.9951	20.9993	20.9986	20.9728	20.7423	20.3368	20.0103	(87)
Th 2	20.0754	20.0774	20.0795	20.0896	20.0916	20.1018	20.1018	20.1038	20.0977	20.0916	20.0876	20.0835	(88)
util rest of house	0.9881	0.9749	0.9344	0.8133	0.6108	0.4065	0.2732	0.3187	0.5750	0.8811	0.9751	0.9908	(89)
MIT 2	18.9805	19.2085	19.5520	19.9077	20.0597	20.0992	20.1016	20.1034	20.0812	19.8497	19.3570	18.9400	(90)
Living area fraction										fLA = Living area / (4) =		0.3938	(91)
MIT	19.4006	19.6096	19.9271	20.2614	20.4133	20.4520	20.4552	20.4559	20.4324	20.2012	19.7428	19.3615	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4006	19.6096	19.9271	20.2614	20.4133	20.4520	20.4552	20.4559	20.4324	20.2012	19.7428	19.3615	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9854	0.9713	0.9316	0.8205	0.6311	0.4319	0.3007	0.3488	0.6037	0.8853	0.9720	0.9885	(94)
Useful gains	635.1459	710.4710	772.9307	776.2341	654.7219	446.6546	295.3987	309.7602	475.6311	605.0051	604.1139	605.9085	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1195.2979	1161.5446	1057.7137	884.1585	676.4145	448.7161	295.6012	310.2221	487.9600	745.3454	986.2898	1188.5583	(97)
Space heating kWh	416.7530	303.1215	211.8785	77.7056	16.1393	0.0000	0.0000	0.0000	0.0000	104.4132	275.1667	433.4914	(98a)
Space heating requirement - total per year (kWh/year)												1838.6692	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	416.7530	303.1215	211.8785	77.7056	16.1393	0.0000	0.0000	0.0000	0.0000	104.4132	275.1667	433.4914	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1838.6692	
Space heating per m2											(98c) / (4) =	23.4494	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	416.7530	303.1215	211.8785	77.7056	16.1393	0.0000	0.0000	0.0000	0.0000	104.4132	275.1667	433.4914	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	416.7530	303.1215	211.8785	77.7056	16.1393	0.0000	0.0000	0.0000	0.0000	104.4132	275.1667	433.4914	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)

Fuel for water heating, kWh/month													
	73.0208	64.4462	68.1347	59.1146	56.7671	50.5680	49.4814	51.7717	52.7004	59.4652	64.0869	72.1195	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.9844	12.6311	13.9844	13.5333	13.9844	13.5333	13.9844	13.9844	13.5333	13.9844	13.5333	13.9844	(231)
Lighting	22.1831	17.7961	16.0235	11.7395	9.0679	7.4086	8.2720	10.7523	13.9662	18.3244	20.6974	22.7997	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1838.6692	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	721.6765	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	164.6551	(230a)
Total electricity for the above, kWh/year	164.6551	(231)
Electricity for lighting (calculated in Appendix L)	179.0307	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2904.0315	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1838.6692	16.4900	303.1965	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	721.6765	16.4900	119.0045	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	164.6551	16.4900	27.1516	(249)
Energy for lighting	179.0307	16.4900	29.5222	(250)
Additional standing charges			0.0000	(251)
Total energy cost			478.8748	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3969	(257)
SAP value		77.3558	
SAP rating (Section 12)		77	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1838.6692	0.1569	288.4993	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	721.6765	0.1412	101.8934	(264)
Space and water heating			390.3927	(265)
Pumps, fans and electric keep-hot	164.6551	0.1387	22.8397	(267)
Energy for lighting	179.0307	0.1443	25.8397	(268)
Total CO2, kg/year			439.0721	(272)
CO2 emissions per m2			5.6000	(273)
EI value			95.2325	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.4100 (1b)	x	2.5500 (2b)	=	199.9455	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.9455	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7200	(17)
Infiltration rate		0.1360	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1156	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1243	0.1185	0.1185	0.1098	0.1127	0.0983	0.0983	0.0954	0.0983	0.1098	0.1069	0.1156	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	71.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2683	0.2625	0.2625	0.2538	0.2567	0.2423	0.2423	0.2394	0.2423	0.2538	0.2509	0.2596	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	89.1300	24.4600	64.6700	0.2100	13.5807	110.0000	7113.6997	(29a)
Communal Wall	15.8200	2.0600	13.7600	0.2200	3.0272	110.0000	1513.6000	(29a)
Lift Shaft	6.1200		6.1200	0.1600	0.9792	110.0000	673.2000	(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.7910			(33)
Main dwelling								
Party Wall 1			11.0000	0.0000	0.0000	110.0000	1210.0000	(32)
Party Floor 1			78.4100			70.0000	5488.7000	(32d)
Party Ceiling 1			78.4100			30.0000	2352.3000	(32b)
Internal Wall 1			155.2800			9.0000	1397.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 19749.0196 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	251.8686 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.1500	0.0380	2.7797
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6000	0.3300	1.1880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E1 Steel lintel with perforated steel base plate	11.2000	0.0500	0.5600
E4 Jamb	37.6900	0.0160	0.6030
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.1383 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 59.9293 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.7010	17.3196	17.3196	16.7476	16.9382	15.9848	15.9848	15.7941	15.9848	16.7476	16.5569	17.1289	(38)
Heat transfer coeff	77.6303	77.2489	77.2489	76.6769	76.8675	75.9141	75.9141	75.7234	75.9141	76.6769	76.4862	77.0582	(39)
Average = Sum(39)m / 12 =												76.6133	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9901	0.9852	0.9852	0.9779	0.9803	0.9682	0.9682	0.9657	0.9682	0.9779	0.9755	0.9828	(40)
HLP (average)												0.9771	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4320 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
64.9963	64.0196	62.5962	59.8729	57.8632	55.6219	54.3480	55.7606	57.3090	59.7154	62.4972	64.7473	(42a)

Hot water usage for baths

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
28.0738	27.6568	27.0697	25.9871	25.1765	24.2777	23.7922	24.3752	25.0100	25.9718	27.0767	27.9789	(42b)

Hot water usage for other uses

	39.5361	38.0984	36.6608	35.2231	33.7854	32.3477	32.3477	33.7854	35.2231	36.6608	38.0984	39.5361 (42c)
Average daily hot water use (litres/day)												121.8952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	132.6062	129.7748	126.3267	121.0831	116.8251	112.2474	110.4879	113.9212	117.5421	122.3480	127.6723	132.2623	(44)
Energy conte	210.0158	184.7977	194.1594	165.7568	157.2691	138.0212	133.6256	141.0582	144.9412	166.0251	181.8927	207.0908	(45)
Energy content (annual)											Total = Sum(45)m =	2024.6535	
Distribution loss (46)m = 0.15 x (45)m													
	31.5024	27.7196	29.1239	24.8635	23.5904	20.7032	20.0438	21.1587	21.7412	24.9038	27.2839	31.0636	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)
											Total per year (kWh/year) = Sum(64)m =	2341.9845	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	69.8303	61.4452	64.5580	55.1141	52.2920	45.8921	44.4305	46.9019	48.1929	55.2033	60.4793	68.8577	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	145.9200	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.3437	22.5100	18.3064	13.8591	10.3598	8.7462	9.4506	12.2842	16.4879	20.9351	24.4344	26.0480	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	322.5155	325.8622	317.4286	299.4745	276.8107	255.5099	241.2797	237.9330	246.3666	264.3206	286.9845	308.2853	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	52.0240	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	-97.2800	(71)
Water heating gains (Table 5)													
	93.8579	91.4363	86.7715	76.5474	70.2849	63.7390	59.7184	63.0401	66.9347	74.1980	83.9990	92.5507	(72)
Total internal gains													
	542.3810	540.4725	523.1705	490.5450	458.1194	428.6591	411.1127	413.9213	430.4531	460.1178	496.0819	527.5479	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
Northeast	16.8300	13.7804	0.3100	0.0000	0.7700	55.3604	(75)
Northwest	2.1800	13.7804	0.3100	0.0000	0.7700	7.1709	(81)

Solar gains	122.1616	200.5642	321.5614	487.2273	604.1786	667.7421	623.7565	530.9123	400.5240	252.2735	147.9919	102.6055	(83)
Total gains	664.5427	741.0368	844.7319	977.7723	1062.2980	1096.4012	1034.8691	944.8336	830.9771	712.3913	644.0738	630.1534	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6662	71.0151	71.0151	71.5449	71.3674	72.2638	72.2638	72.4457	72.2638	71.5449	71.7233	71.1908	
alpha	5.7111	5.7343	5.7343	5.7697	5.7578	5.8176	5.8176	5.8297	5.8176	5.7697	5.7816	5.7461	
util living area													
	0.9863	0.9732	0.9271	0.7873	0.5746	0.3594	0.2420	0.2724	0.5405	0.8616	0.9698	0.9892	(86)
MIT	20.1898	20.3545	20.6254	20.8859	20.9829	20.9991	20.9999	20.9999	20.9911	20.8392	20.4811	20.1565	(87)
Th 2	20.0916	20.0957	20.0957	20.1018	20.0998	20.1099	20.1099	20.1120	20.1099	20.1018	20.1038	20.0977	(88)
util rest of house													
	0.9821	0.9652	0.9071	0.7434	0.5151	0.2982	0.1768	0.2013	0.4638	0.8175	0.9592	0.9858	(89)
MIT 2	19.1736	19.3824	19.7101	20.0020	20.0885	20.1096	20.1099	20.1120	20.1055	19.9629	19.5491	19.1365	(90)
Living area fraction											fLA = Living area / (4) =	0.3938	(91)
MIT	19.5738	19.7653	20.0706	20.3501	20.4407	20.4599	20.4604	20.4616	20.4543	20.3080	19.9162	19.5382	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5738	19.7653	20.0706	20.3501	20.4407	20.4599	20.4604	20.4616	20.4543	20.3080	19.9162	19.5382	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9790	0.9617	0.9065	0.7561	0.5379	0.3223	0.2025	0.2293	0.4939	0.8286	0.9565	0.9831	(94)
Useful gains	650.6072	712.6243	765.7108	739.3172	571.4498	353.4185	209.5408	216.6620	410.4138	590.2947	616.0293	619.5019	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1123.6059	1086.5255	978.7879	801.2846	579.6348	353.7509	209.5562	216.6933	414.0555	675.3710	911.4240	1112.5814	(97)
Space heating kWh													

	351.9110	251.2616	158.5294	44.6165	6.0896	0.0000	0.0000	0.0000	0.0000	63.2968	212.6842	366.8512 (98a)
Space heating requirement - total per year (kWh/year)												1455.2403
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	351.9110	251.2616	158.5294	44.6165	6.0896	0.0000	0.0000	0.0000	0.0000	63.2968	212.6842	366.8512 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1455.2403
Space heating per m2											(98c) / (4) =	18.5594 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	351.9110	251.2616	158.5294	44.6165	6.0896	0.0000	0.0000	0.0000	0.0000	63.2968	212.6842	366.8512	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	351.9110	251.2616	158.5294	44.6165	6.0896	0.0000	0.0000	0.0000	0.0000	63.2968	212.6842	366.8512	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	236.9672	209.1409	221.1108	191.8388	184.2205	164.1032	160.5770	168.0096	171.0232	192.9765	207.9747	234.0422	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	73.0208	64.4462	68.1347	59.1146	56.7671	50.5680	49.4814	51.7717	52.7004	59.4652	64.0869	72.1195	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.9844	12.6311	13.9844	13.5333	13.9844	13.5333	13.9844	13.9844	13.5333	13.9844	13.5333	13.9844	(231)
Lighting	22.1831	17.7961	16.0235	11.7395	9.0679	7.4086	8.2720	10.7523	13.9662	18.3244	20.6974	22.7997	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1455.2403 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	721.6765 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	164.6551 (230a)
Total electricity for the above, kWh/year	164.6551 (231)
Electricity for lighting (calculated in Appendix L)	179.0307 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2520.6026 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1455.2403	27.6700	402.6650	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	721.6765	27.6700	199.6879	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	164.6551	27.6700	45.5601	(249)
Energy for lighting	179.0307	27.6700	49.5378	(250)
Additional standing charges			0.0000	(251)
Total energy cost			697.4507	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1455.2403	0.1577	229.5228	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	721.6765	0.1412	101.8934	(264)
Space and water heating			331.4161	(265)
Pumps, fans and electric keep-hot	164.6551	0.1387	22.8397	(267)
Energy for lighting	179.0307	0.1443	25.8397	(268)
Total CO2, kg/year			380.0955	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1455.2403	1.5839	2304.9034	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	721.6765	1.5221	1098.4516	(278)
Space and water heating			3403.3550	(279)
Pumps, fans and electric keep-hot	164.6551	1.5128	249.0903	(281)
Energy for lighting	179.0307	1.5338	274.6033	(282)
Total Primary energy kWh/year			3927.0486	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-03	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-03
Plot Address	Flat 3, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	80 C	**DER**	6.07	**TER**	15.88
Environmental	96 A	**% DER < TER**			61.78
CO_2 Emissions (t/year)	0.27	**DFEE**	41.98	**TFEE**	44.58
Compliance Check	See BREL	**% DFEE < TFEE**			5.83
% DPER < TPER	25.43	**DPER**	62.69	**TPER**	84.07

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	316.47	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	28.96 m	55.18 m²	2.55 m

8.0 Living Area 27.50 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	59.56	45.96	0.00	None	13.60	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	15.54	13.48	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	8.04	8.04	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	10.16	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	102.23

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	55.18

11.0 Heat Loss Floors

Summary for Input Data

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Exposed Floor	Exposed Floor - Solid	Lowest occupied	Other	0.12	None	0.00	75.00	55.18

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-GBY	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	North West	2.06	
Patio Door	Patio Door	Brickwork	South West	5.42	
West	Window-GBY	Brickwork	South West	2.72	
South	Window-GBY	Brickwork	South East	5.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	55.66	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	11.40	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.70	-0.10	-0.10	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	2.26	0.33	0.33	AbbeyCalculated	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	7.08	0.00	0.00		No
E18 Party wall between dwellings	Gov Approved Scheme	2.85	0.04	0.04	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	5.70	0.03	0.03		No
E1 Steel lintel with perforated steel base plate	Independently assessed	6.67	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	23.90	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	42.11	0.11	0.11	RCD	No

Y-value	0.06	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0

Summary for Input Data

elmhurst energy

Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.62	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	10

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To

Summary for Input Data

Above Bath	Combi boiler or unvented hot water system	8.00	No

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-03	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-03
Plot Address	Flat 3, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	80 C	**DER**	6.07	**TER**	15.88
Environmental	96 A	**% DER < TER**			61.78
CO_2 Emissions (t/year)	0.27	**DFEE**	41.98	**TFEE**	44.58
Compliance Check	See BREL	**% DFEE < TFEE**			5.83
% DPER < TPER	25.43	**DPER**	62.69	**TPER**	84.07

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.7090	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6200	(17)
Infiltration rate		0.1310	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1114	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1420	0.1392	0.1364	0.1225	0.1197	0.1058	0.1058	0.1030	0.1114	0.1197	0.1253	0.1308	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

Effective ac	0.2780	0.2752	0.2724	0.2585	0.2557	0.2418	0.2418	0.2390	0.2474	0.2557	0.2613	0.2668	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Exposed Floor			55.1800	0.1200	6.6216	75.0000	4138.5000	(28b)
Brickwork	59.5600	13.5900	45.9700	0.2100	9.6537	110.0000	5056.7002	(29a)
Communal Wall	15.5400	2.0600	13.4800	0.2200	2.9656	110.0000	1482.8000	(29a)
Stairwell Wall	8.0400		8.0400	0.1600	1.2864	110.0000	884.4000	(29a)
Total net area of external elements Aum(A, m2)			138.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.5604			(33)
Main dwelling								
Party Wall 1			10.1600	0.0000	0.0000	110.0000	1117.6000	(32)
Party Ceiling 1			55.1800			30.0000	1655.4000	(32b)
Internal Wall 1			102.2300			9.0000	920.0700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15255.4702 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.4674 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E7 Party floor between dwellings (in blocks of flats)	55.6600	0.0380	2.1151
	E16 Corner (normal)	11.4000	0.0540	0.6156
	E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
	E18 Party wall between dwellings	2.8500	0.0380	0.1083
	E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
	E1 Steel lintel with perforated steel base plate	6.7000	0.0500	0.3335
	E4 Jamb	23.9000	0.0160	0.3824
	E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.6408 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.2012 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9073	12.7780	12.6488	12.0025	11.8732	11.2269	11.2269	11.0977	11.4854	11.8732	12.1317	12.3903	(38)
Heat transfer coeff	60.1085	59.9792	59.8500	59.2037	59.0744	58.4281	58.4281	58.2988	58.6866	59.0744	59.3329	59.5914	(39)

Average = Sum(39)m / 12 = 59.1713

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0893	1.0870	1.0846	1.0729	1.0706	1.0589	1.0589	1.0565	1.0635	1.0706	1.0753	1.0799	(40)
HLP (average)												1.0723	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)
Hot water usage for mixer showers

55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
										Total per year (kWh/year) = Sum(64)m =		2034.0749	(64)
12Total per year (kWh/year)												2034	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0292	89.7109	81.0292	83.7301	81.0292	83.7301	81.0292	81.0292	83.7301	81.0292	83.7301	81.0292	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)
Total internal gains	371.9017	380.1975	363.3598	348.4483	329.1482	315.6885	302.4900	303.6393	313.8432	326.2441	348.5447	363.7049	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(79)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)

Southwest			2.7200		36.7938		0.3300		0.0000		0.7700		25.4301 (79)
Solar gains	127.0572	216.4254	296.1226	366.9103	410.9701	407.9982	393.3538	360.4832	320.6382	239.1961	152.1852	108.7345	(83)
Total gains	498.9589	596.6229	659.4824	715.3586	740.1182	723.6867	695.8437	664.1224	634.4813	565.4402	500.7299	472.4394	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.4997	70.6516	70.8042	71.5772	71.7338	72.5273	72.5273	72.6881	72.2078	71.7338	71.4212	71.1114	
alpha	5.7000	5.7101	5.7203	5.7718	5.7823	5.8352	5.8352	5.8459	5.8139	5.7823	5.7614	5.7408	
util living area	0.9906	0.9746	0.9407	0.8529	0.7029	0.5114	0.3688	0.4026	0.6204	0.8855	0.9770	0.9929	(86)
MIT	20.0771	20.3038	20.5515	20.8071	20.9471	20.9929	20.9991	20.9985	20.9795	20.7935	20.3909	20.0348	(87)
Th 2	20.0096	20.0115	20.0134	20.0230	20.0249	20.0346	20.0346	20.0365	20.0307	20.0249	20.0211	20.0172	(88)
util rest of house	0.9874	0.9666	0.9230	0.8149	0.6421	0.4367	0.2882	0.3189	0.5409	0.8459	0.9684	0.9904	(89)
MIT 2	18.9600	19.2450	19.5481	19.8468	19.9863	20.0312	20.0343	20.0361	20.0193	19.8420	19.3648	18.9124	(90)
Living area fraction										fLA = Living area / (4) =		0.4984	(91)
MIT	19.5168	19.7727	20.0482	20.3254	20.4651	20.5105	20.5152	20.5157	20.4978	20.3162	19.8762	19.4718	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5168	19.7727	20.0482	20.3254	20.4651	20.5105	20.5152	20.5157	20.4978	20.3162	19.8762	19.4718	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9854	0.9643	0.9237	0.8275	0.6704	0.4738	0.3284	0.3607	0.5800	0.8589	0.9669	0.9887	(94)
Useful gains	491.6653	575.3168	609.1826	591.9288	496.1632	342.9142	228.5218	239.5436	368.0002	485.6379	484.1369	467.1050	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	914.6558	892.0527	810.8564	676.4246	517.7947	345.3380	228.7548	239.9428	375.4673	573.9768	758.0482	910.0679	(97)
Space heating kWh	314.7049	212.8466	150.0453	60.8370	16.0939	0.0000	0.0000	0.0000	0.0000	65.7241	197.2161	329.5644	(98a)
Space heating requirement - total per year (kWh/year)												1347.0323	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	314.7049	212.8466	150.0453	60.8370	16.0939	0.0000	0.0000	0.0000	0.0000	65.7241	197.2161	329.5644	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1347.0323	
Space heating per m2										(98c) / (4) =		24.4116	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	314.7049	212.8466	150.0453	60.8370	16.0939	0.0000	0.0000	0.0000	0.0000	65.7241	197.2161	329.5644	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	314.7049	212.8466	150.0453	60.8370	16.0939	0.0000	0.0000	0.0000	0.0000	65.7241	197.2161	329.5644	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.5935	8.6651	9.5935	9.2840	9.5935	9.2840	9.5935	9.5935	9.2840	9.5935	9.2840	9.5935	(231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1347.0323	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	324.5200	
Water heating fuel used	626.7949	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)		
mechanical ventilation fans (SFP = 0.6580)	112.9556	(230a)
Total electricity for the above, kWh/year	112.9556	(231)
Electricity for lighting (calculated in Appendix L)	133.1010	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2219.8838	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1347.0323	0.1571	211.5705	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			300.0307	(265)
Pumps, fans and electric keep-hot	112.9556	0.1387	15.6683	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			334.9096	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.0700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1347.0323	1.5814	2130.2383	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	1.5219	953.8959	(278)
Space and water heating			3084.1342	(279)
Pumps, fans and electric keep-hot	112.9556	1.5128	170.8792	(281)
Energy for lighting	133.1010	1.5338	204.1547	(282)
Total Primary energy kWh/year			3459.1681	(286)
Dwelling Primary energy Rate (DPER)			62.6900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b) x	2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.7090	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1421	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3921	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3333	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4250	0.4166	0.4083	0.3666	0.3583	0.3167	0.3167	0.3083	0.3333	0.3583	0.3750	0.3916	(22b)

Effective ac	0.5903	0.5868	0.5834	0.5672	0.5642	0.5501	0.5501	0.5475	0.5556	0.5642	0.5703	0.5767	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.7400	1.1450	13.4427			(27)
Exposed Floor			55.1800	0.1300	7.1734			(28b)
Brickwork	59.5600	11.7400	47.8200	0.1800	8.6076			(29a)
Communal Wall	15.5400	2.0600	13.4800	0.1800	2.4264			(29a)
Stairwell Wall	8.0400		8.0400	0.1800	1.4472			(29a)
Total net area of external elements Aum(A, m2)			138.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.1573			(33)
Main dwelling								
Party Wall 1			10.1600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.4674 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	55.6600	0.0700	3.8962
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.0200	0.0452
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	5.7000	0.0600	0.3420
E1 Steel lintel with perforated steel base plate	6.6700	0.0500	0.3335
E4 Jamb	23.9000	0.0500	1.1950
E5 Ground floor (normal)	42.1100	0.1600	6.7376

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.2335 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 48.3908 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.4101	27.2473	27.0877	26.3381	26.1978	25.5449	25.5449	25.4240	25.7964	26.1978	26.4815	26.7782	(38)
Heat transfer coeff	75.8010	75.6382	75.4786	74.7289	74.5887	73.9357	73.9357	73.8148	74.1872	74.5887	74.8724	75.1690	(39)

Average = Sum(39)m / 12 = 74.7282

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3737	1.3708	1.3679	1.3543	1.3517	1.3399	1.3399	1.3377	1.3445	1.3517	1.3569	1.3623	(40)
HLP (average)												1.3543	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)

Hot water usage for mixer showers

55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	

Distribution loss (46)m = 0.15 x (45)m

26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.6708	198.7794	211.2272	185.6408	179.9472	162.1236	159.8990	166.2009	167.9899	187.3702	199.3217	222.1905	(62)
WWHRS -25.1960	-22.2836	-23.3341	-19.3215	-18.0070	-15.4087	-14.4432	-15.3589	-15.9424	-18.7944	-21.2917	-24.7294	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

199.4748	176.4959	187.8932	166.3193	161.9403	146.7149	145.4558	150.8420	152.0474	168.5759	178.0300	197.4611	(64)
								Total per year (kWh/year) = Sum(64)m =			2031.2506	(64)

12Total per year (kWh/year) 2031 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

96.4862	85.7692	92.0162	82.8060	81.6156	74.9865	74.9495	77.0449	76.9371	84.0837	87.3549	95.6615	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.1824	89.8805	81.1824	83.8885	81.1824	83.8885	81.1824	81.1824	83.8885	81.1824	83.8885	81.1824	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)													
	129.6857	127.6328	123.6776	115.0084	109.6984	104.1480	100.7386	103.5550	106.8570	113.0158	121.3262	128.5772	(72)
Total internal gains													
	425.1570	433.4692	416.6151	401.7087	382.4035	365.9489	352.7452	353.8946	364.1036	379.4994	401.8051	416.9602	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.7100	36.7938	0.6300	0.7000	0.7700	52.9624	(77)
Southwest	7.0300	36.7938	0.6300	0.7000	0.7700	79.0501	(79)

Solar gains	132.0125	224.8661	307.6716	381.2200	426.9982	423.9103	408.6948	374.5422	333.1432	248.5249	158.1205	112.9752	(83)
Total gains	557.1695	658.3353	724.2866	782.9287	809.4016	789.8593	761.4400	728.4368	697.2468	628.0243	559.9256	529.9354	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.9047	56.0250	56.1435	56.7067	56.8133	57.3150	57.3150	57.4089	57.1207	56.8133	56.5980	56.3747	
alpha	4.7270	4.7350	4.7429	4.7804	4.7876	4.8210	4.8210	4.8273	4.8080	4.7876	4.7732	4.7583	
util living area													
	0.9883	0.9743	0.9473	0.8808	0.7579	0.5777	0.4232	0.4598	0.6812	0.9018	0.9753	0.9906	(86)
MIT	19.7643	20.0037	20.2939	20.6280	20.8609	20.9706	20.9946	20.9920	20.9359	20.6370	20.1431	19.7228	(87)
Th 2	19.7836	19.7858	19.7881	19.7986	19.8005	19.8097	19.8097	19.8114	19.8062	19.8005	19.7966	19.7924	(88)
util rest of house													
	0.9843	0.9657	0.9299	0.8429	0.6893	0.4797	0.3109	0.3443	0.5842	0.8617	0.9655	0.9873	(89)
MIT 2	18.3974	18.6986	19.0569	19.4550	19.6975	19.7957	19.8084	19.8092	19.7706	19.4778	18.8851	18.3513	(90)
Living area fraction									fLA = Living area / (4) =			0.4984	(91)
MIT	19.0786	19.3490	19.6734	20.0396	20.2773	20.3813	20.3996	20.3987	20.3513	20.0555	19.5121	19.0348	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0786	19.3490	19.6734	20.0396	20.2773	20.3813	20.3996	20.3987	20.3513	20.0555	19.5121	19.0348	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9811	0.9618	0.9279	0.8513	0.7182	0.5279	0.3670	0.4021	0.6305	0.8715	0.9626	0.9846	(94)
Useful gains	546.6626	633.2167	672.0581	666.5442	581.2899	416.9879	279.4702	292.9090	439.6461	547.3013	538.9779	521.7541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1120.2339	1092.8987	994.3097	832.4468	639.7692	427.4412	280.9232	295.1622	463.7690	705.2734	929.3219	1115.1177	(97)
Space heating kWh													
	426.7370	308.9063	239.7552	119.4499	43.5086	0.0000	0.0000	0.0000	0.0000	117.5312	281.0477	441.4625	(98a)
Space heating requirement - total per year (kWh/year)												1978.3984	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	426.7370	308.9063	239.7552	119.4499	43.5086	0.0000	0.0000	0.0000	0.0000	117.5312	281.0477	441.4625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1978.3984	
Space heating per m2											(98c) / (4) =	35.8535	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	426.7370	308.9063	239.7552	119.4499	43.5086	0.0000	0.0000	0.0000	0.0000	117.5312	281.0477	441.4625	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	462.3370	334.6764	259.7564	129.4149	47.1383	0.0000	0.0000	0.0000	0.0000	127.3361	304.4937	478.2909	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	199.4748	176.4959	187.8932	166.3193	161.9403	146.7149	145.4558	150.8420	152.0474	168.5759	178.0300	197.4611	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7204	85.3019	84.6075	83.3302	81.5504	79.8000	79.8000	79.8000	79.8000	83.2668	85.0789	85.8091	(217)
Fuel for water heating, kWh/month													
	232.7040	206.9073	222.0762	199.5906	198.5770	183.8533	182.2755	189.0251	190.5356	202.4528	209.2527	230.1168	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8681	13.5322	12.1843	8.9267	6.8952	5.6335	6.2901	8.1761	10.6199	13.9339	15.7383	17.3369	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.9352	-27.6450	-41.1459	-47.9752	-53.2440	-50.2762	-49.6849	-46.1683	-40.2014	-32.3911	-21.1603	-16.2633	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-7.9963	-17.0701	-34.3843	-52.3058	-69.7954	-70.3350	-69.4835	-58.5226	-42.5058	-24.6039	-10.7403	-6.3031	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2143.4436	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2447.3669	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	136.1352	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-909.1366	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3903.8092	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2143.4436	0.2100	450.1232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2447.3669	0.2100	513.9471	(264)
Space and water heating			964.0702	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.1352	0.1443	19.6485	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-445.0905	0.1338	-59.5685	
PV Unit electricity exported	-464.0461	0.1255	-58.2526	
Total			-117.8211	(269)
Total CO2, kg/year			877.8269	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2143.4436	1.1300	2422.0913	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2447.3669	1.1300	2765.5246	(278)
Space and water heating			5187.6159	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.1352	1.5338	208.8088	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-445.0905	1.4946	-665.2265	
PV Unit electricity exported	-464.0461	0.4608	-213.8196	
Total			-879.0461	(283)
Total Primary energy kWh/year			4647.4793	(286)
Target Primary Energy Rate (TPER)			84.2200	(287)

Full SAP Calculation Printout

Plot Reference	P-03	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-03
Plot Address	Flat 3, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	80 C	**DER**	6.07	**TER**	15.88
Environmental	96 A	**% DER < TER**			61.78
CO_2 Emissions (t/year)	0.27	**DFEE**	41.98	**TFEE**	44.58
Compliance Check	See BREL	**% DFEE < TFEE**			5.83
% DPER < TPER	25.43	**DPER**	62.69	**TPER**	84.07

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.7090	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1421	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6200	(17)
Infiltration rate		0.2731	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2322	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2960	0.2902	0.2844	0.2554	0.2496	0.2206	0.2206	0.2148	0.2322	0.2496	0.2612	0.2728	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5438	0.5421	0.5404	0.5326	0.5311	0.5243	0.5243	0.5231	0.5270	0.5311	0.5341	0.5372	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Exposed Floor			55.1800	0.1200	6.6216	75.0000	4138.5000	(28b)
Brickwork	59.5600	13.5900	45.9700	0.2100	9.6537	110.0000	5056.7002	(29a)
Communal Wall	15.5400	2.0600	13.4800	0.2200	2.9656	110.0000	1482.8000	(29a)
Stairwell Wall	8.0400		8.0400	0.1600	1.2864	110.0000	884.4000	(29a)
Total net area of external elements Aum(A, m2)			138.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.5604			(33)
Main dwelling								
Party Wall 1			10.1600	0.0000	0.0000	110.0000	1117.6000	(32)
Party Ceiling 1			55.1800			30.0000	1655.4000	(32b)
Internal Wall 1			102.2300			9.0000	920.0700	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15255.4702	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							276.4674	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	55.6600	0.0380	2.1151	
E16 Corner (normal)	11.4000	0.0540	0.6156	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000	
E18 Party wall between dwellings	2.8500	0.0380	0.1083	
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767	
E1 Steel lintel with perforated steel base plate	6.6700	0.0500	0.3335	
E4 Jamb	23.9000	0.0160	0.3824	
E5 Ground floor (normal)	42.1100	0.1120	4.7163	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.6408 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	47.2012 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.2513	25.1723	25.0949	24.7312	24.6632	24.3464	24.3464	24.2877	24.4684	24.6632	24.8008	24.9447	(38)
Heat transfer coeff	72.4525	72.3735	72.2961	71.9324	71.8643	71.5476	71.5476	71.4889	71.6696	71.8643	72.0020	72.1459	(39)
Average = Sum(39)m / 12 =												71.9321	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3130	1.3116	1.3102	1.3036	1.3024	1.2966	1.2966	1.2956	1.2988	1.3024	1.3049	1.3075	(40)
HLP (average)												1.3036	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 52.5437 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.3246	55.7526	54.0361	51.8993	49.9931	48.0122	47.6002	49.3131	51.0700	53.1044	55.2602	57.2441	(44)
Energy conte	90.7882	79.3910	83.0515	71.0475	67.3004	59.0366	57.5683	61.0599	62.9745	72.0622	78.7283	89.6304	(45)
Energy content (annual)											Total = Sum(45)m =	872.6387	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	77.1700	67.4823	70.5938	60.3904	57.2053	50.1811	48.9330	51.9010	53.5283	61.2529	66.9191	76.1858	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	77.1700	67.4823	70.5938	60.3904	57.2053	50.1811	48.9330	51.9010	53.5283	61.2529	66.9191	76.1858	(64)
										Total per year (kWh/year) = Sum(64)m =		741.7429	(64)
12Total per year (kWh/year)												742	(64)
Electric shower(s)	44.1375	39.3268	42.9434	40.9804	41.7493	39.8248	41.1523	41.7493	40.9804	42.9434	42.1359	44.1375	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							502.0610	(64a)
Heat gains from water heating, kWh/month	30.3269	26.7023	28.3843	25.3427	24.7387	22.5015	22.5213	23.4126	23.6272	26.0491	27.2637	30.0808	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0292	89.7109	81.0292	83.7301	81.0292	83.7301	81.0292	81.0292	83.7301	81.0292	83.7301	81.0292	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)	40.7619	39.7355	38.1509	35.1982	33.2509	31.2520	30.2706	31.4685	32.8155	35.0122	37.8663	40.4312	(72)
Total internal gains	333.0799	342.4023	327.9351	318.7402	302.8028	292.8947	282.1240	281.6548	289.9037	298.3426	315.1868	325.6610	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(79)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Southwest	2.7200	36.7938	0.3300	0.0000	0.7700	25.4301	(79)

Solar gains	127.0572	216.4254	296.1226	366.9103	410.9701	407.9982	393.3538	360.4832	320.6382	239.1961	152.1852	108.7345	(83)
Total gains	460.1371	558.8277	624.0577	685.6504	713.7728	700.8928	675.4777	642.1380	610.5418	537.5387	467.3720	434.3954	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.4884	58.5522	58.6149	58.9113	58.9671	59.2282	59.2282	59.2768	59.1273	58.9671	58.8544	58.7370	
alpha	4.8992	4.9035	4.9077	4.9274	4.9311	4.9485	4.9485	4.9518	4.9418	4.9311	4.9236	4.9158	
util living area	0.9945	0.9856	0.9667	0.9134	0.8029	0.6234	0.4603	0.5029	0.7339	0.9356	0.9873	0.9959	(86)
MIT	19.6873	19.9277	20.2232	20.5735	20.8336	20.9633	20.9932	20.9896	20.9188	20.5727	20.0576	19.6387	(87)
Th 2	19.8306	19.8318	19.8329	19.8380	19.8390	19.8435	19.8435	19.8443	19.8417	19.8390	19.8370	19.8350	(88)
util rest of house	0.9926	0.9806	0.9548	0.8830	0.7395	0.5237	0.3424	0.3814	0.6394	0.9059	0.9819	0.9943	(89)
MIT 2	18.6642	18.9021	19.1903	19.5210	19.7392	19.8293	19.8421	19.8420	19.8048	19.5296	19.0365	18.6194	(90)
Living area fraction										fLA = Living area / (4) =		0.4984	(91)
MIT	19.1741	19.4132	19.7051	20.0455	20.2846	20.3944	20.4158	20.4139	20.3600	20.0495	19.5454	19.1274	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1741	19.4132	19.7051	20.0455	20.2846	20.3944	20.4158	20.4139	20.3600	20.0495	19.5454	19.1274	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9911	0.9783	0.9532	0.8891	0.7656	0.5727	0.4014	0.4423	0.6842	0.9122	0.9802	0.9931	(94)
Useful gains	456.0332	546.6877	594.8604	609.6359	546.4746	401.4005	271.1638	283.9862	417.7444	490.3607	458.1057	431.3944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1077.6645	1050.3727	954.6745	801.7250	616.9264	414.5785	273.0104	286.9511	448.6502	679.0798	896.0936	1076.9499	(97)
Space heating kWh	462.4937	338.4763	267.7017	138.3041	52.4161	0.0000	0.0000	0.0000	0.0000	140.4070	315.3513	480.2933	(98a)
Space heating requirement - total per year (kWh/year)												2195.4436	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	462.4937	338.4763	267.7017	138.3041	52.4161	0.0000	0.0000	0.0000	0.0000	140.4070	315.3513	480.2933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2195.4436	
Space heating per m2											(98c) / (4) =	39.7869	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	672.5471	529.4520	543.3157	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8912	0.9431	0.9266	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	599.3556	499.3148	503.4343	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	789.9335	761.8267	724.4133	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	137.2161	195.3089	164.4083	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.3040	48.8272	41.1021	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												124.2333	(107)
Energy for space heating												39.7869	(99)
Energy for space cooling												2.2514	(108)
Total												42.0384	(109)
Fabric Energy Efficiency (DFEE)												42.0	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.7090	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1421	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3921	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3333	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4250	0.4166	0.4083	0.3666	0.3583	0.3167	0.3167	0.3083	0.3333	0.3583	0.3750	0.3916	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5903	0.5868	0.5834	0.5672	0.5642	0.5501	0.5501	0.5475	0.5556	0.5642	0.5703	0.5767	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.7400	1.1450	13.4427			(27)
Exposed Floor			55.1800	0.1300	7.1734			(28b)
Brickwork	59.5600	11.7400	47.8200	0.1800	8.6076			(29a)
Communal Wall	15.5400	2.0600	13.4800	0.1800	2.4264			(29a)
Stairwell Wall	8.0400		8.0400	0.1800	1.4472			(29a)
Total net area of external elements Aum(A, m2)			138.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.1573			(33)
Main dwelling								
Party Wall 1			10.1600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	276.4674	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	55.6600	0.0700	3.8962
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.0200	0.0452
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	5.7000	0.0600	0.3420
E1 Steel lintel with perforated steel base plate	6.6700	0.0500	0.3335
E4 Jamb	23.9000	0.0500	1.1950
E5 Ground floor (normal)	42.1100	0.1600	6.7376

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.2335	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 48.3908	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.4101	27.2473	27.0877	26.3381	26.1978	25.5449	25.5449	25.4240	25.7964	26.1978	26.4815	26.7782	(38)
Heat transfer coeff													
	75.8010	75.6382	75.4786	74.7289	74.5887	73.9357	73.9357	73.8148	74.1872	74.5887	74.8724	75.1690	(39)
Average = Sum(39)m / 12 =												74.7282	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3737	1.3708	1.3679	1.3543	1.3517	1.3399	1.3399	1.3377	1.3445	1.3517	1.3569	1.3623	(40)
HLP (average)												1.3543	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8426	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day)	52.5437	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	57.3246	55.7526	54.0361	51.8993	49.9931	48.0122	47.6002	49.3131	51.0700	53.1044	55.2602	57.2441	(44)
Energy conte	90.7882	79.3910	83.0515	71.0475	67.3004	59.0366	57.5683	61.0599	62.9745	72.0622	78.7283	89.6304	(45)
Energy content (annual)										Total = Sum(45)m =		872.6387	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	77.1700	67.4823	70.5938	60.3904	57.2053	50.1811	48.9330	51.9010	53.5283	61.2529	66.9191	76.1858	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	77.1700	67.4823	70.5938	60.3904	57.2053	50.1811	48.9330	51.9010	53.5283	61.2529	66.9191	76.1858	(64)
										Total per year (kWh/year) = Sum(64)m =		741.7429	(64)
12Total per year (kWh/year)												742	(64)
Electric shower(s)													
	44.1375	39.3268	42.9434	40.9804	41.7493	39.8248	41.1523	41.7493	40.9804	42.9434	42.1359	44.1375	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		502.0610	(64a)

Heat gains from water heating, kWh/month

	30.3269	26.7023	28.3843	25.3427	24.7387	22.5015	22.5213	23.4126	23.6272	26.0491	27.2637	30.0808 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	81.1824	89.8805	81.1824	83.8885	81.1824	83.8885	81.1824	81.1824	83.8885	81.1824	83.8885	81.1824	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)

Water heating gains (Table 5)

	40.7619	39.7355	38.1509	35.1982	33.2509	31.2520	30.2706	31.4685	32.8155	35.0122	37.8663	40.4312	(72)

Total internal gains

	333.2332	342.5720	328.0884	318.8985	302.9560	293.0530	282.2772	281.8081	290.0620	298.4958	315.3452	325.8142	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.7100	36.7938	0.6300	0.7000	0.7700	52.9624	(77)
Southwest	7.0300	36.7938	0.6300	0.7000	0.7700	79.0501	(79)

Solar gains	132.0125	224.8661	307.6716	381.2200	426.9982	423.9103	408.6948	374.5422	333.1432	248.5249	158.1205	112.9752	(83)
Total gains	465.2457	567.4381	635.7599	700.1185	729.9542	716.9633	690.9720	656.3503	623.2053	547.0207	473.4657	438.7894	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.9047	56.0250	56.1435	56.7067	56.8133	57.3150	57.3150	57.4089	57.1207	56.8133	56.5980	56.3747	
alpha	4.7270	4.7350	4.7429	4.7804	4.7876	4.8210	4.8210	4.8273	4.8080	4.7876	4.7732	4.7583	
util living area	0.9944	0.9855	0.9666	0.9139	0.8055	0.6268	0.4641	0.5067	0.7377	0.9362	0.9872	0.9957	(86)
MIT	19.6123	19.8616	20.1701	20.5418	20.8167	20.9586	20.9920	20.9879	20.9095	20.5429	20.0067	19.5704	(87)
Th 2	19.7836	19.7858	19.7881	19.7986	19.8005	19.8097	19.8097	19.8114	19.8062	19.8005	19.7966	19.7924	(88)
util rest of house	0.9924	0.9803	0.9546	0.8831	0.7410	0.5245	0.3421	0.3813	0.6413	0.9063	0.9817	0.9941	(89)
MIT 2	18.5535	18.8011	19.1031	19.4586	19.6908	19.7938	19.8081	19.8088	19.7651	19.4702	18.9549	18.5187	(90)
Living area fraction										fLA = Living area / (4) =		0.4984	(91)
MIT	19.0811	19.3296	19.6349	19.9985	20.2519	20.3743	20.3981	20.3964	20.3355	20.0048	19.4791	19.0428	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0811	19.3296	19.6349	19.9985	20.2519	20.3743	20.3981	20.3964	20.3355	20.0048	19.4791	19.0428	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9778	0.9527	0.8890	0.7672	0.5747	0.4033	0.4442	0.6868	0.9123	0.9798	0.9928	(94)
Useful gains	460.9482	554.8355	605.6899	622.3798	559.9957	412.0107	278.6348	291.5421	428.0222	499.0272	463.8854	435.6364	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1120.4252	1091.4310	991.4008	829.3762	637.8759	426.9274	280.8177	294.9945	462.5909	701.4928	926.8524	1115.7224	(97)
Space heating kWh	490.6508	360.5922	286.9689	149.0374	57.9429	0.0000	0.0000	0.0000	0.0000	150.6344	333.3362	505.9840	(98a)
Space heating requirement - total per year (kWh/year)												2335.1468	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	490.6508	360.5922	286.9689	149.0374	57.9429	0.0000	0.0000	0.0000	0.0000	150.6344	333.3362	505.9840	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2335.1468	
Space heating per m2											(98c) / (4) =	42.3187	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	694.9960	547.1245	560.9928	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8844	0.9381	0.9210	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	614.6391	513.2397	516.6481	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	808.5455	779.7723	740.8648	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	139.6126	198.3002	166.8172	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.9032	49.5750	41.7043	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												126.1825	(107)
Energy for space heating												42.3187	(99)
Energy for space cooling												2.2867	(108)
Total												44.6055	(109)
Fabric Energy Efficiency (TFEE)												44.6	(109)

Full SAP Calculation Printout

Plot Reference	P-03	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-03
Plot Address	Flat 3, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	80 C	**DER**	6.07	**TER**	15.88
Environmental	96 A	**% DER < TER**			61.78
CO_2 Emissions (t/year)	0.27	**DFEE**	41.98	**TFEE**	44.58
Compliance Check	See BREL	**% DFEE < TFEE**			5.83
% DPER < TPER	25.43	**DPER**	62.69	**TPER**	84.07

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.7090	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6200	(17)
Infiltration rate		0.1310	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1114	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1420	0.1392	0.1364	0.1225	0.1197	0.1058	0.1058	0.1030	0.1114	0.1197	0.1253	0.1308	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

Effective ac	0.2780	0.2752	0.2724	0.2585	0.2557	0.2418	0.2418	0.2390	0.2474	0.2557	0.2613	0.2668	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Exposed Floor			55.1800	0.1200	6.6216	75.0000	4138.5000	(28b)
Brickwork	59.5600	13.5900	45.9700	0.2100	9.6537	110.0000	5056.7002	(29a)
Communal Wall	15.5400	2.0600	13.4800	0.2200	2.9656	110.0000	1482.8000	(29a)
Stairwell Wall	8.0400		8.0400	0.1600	1.2864	110.0000	884.4000	(29a)
Total net area of external elements Aum(A, m2)			138.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.5604			(33)
Main dwelling								
Party Wall 1			10.1600	0.0000	0.0000	110.0000	1117.6000	(32)
Party Ceiling 1			55.1800			30.0000	1655.4000	(32b)
Internal Wall 1			102.2300			9.0000	920.0700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15255.4702 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.4674 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E7 Party floor between dwellings (in blocks of flats)	55.6600	0.0380	2.1151
	E16 Corner (normal)	11.4000	0.0540	0.6156
	E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
	E18 Party wall between dwellings	2.8500	0.0380	0.1083
	E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
	E1 Steel lintel with perforated steel base plate	6.7000	0.0500	0.3335
	E4 Jamb	23.9000	0.0160	0.3824
	E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.6408 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.2012 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9073	12.7780	12.6488	12.0025	11.8732	11.2269	11.2269	11.0977	11.4854	11.8732	12.1317	12.3903	(38)
Heat transfer coeff	60.1085	59.9792	59.8500	59.2037	59.0744	58.4281	58.4281	58.2988	58.6866	59.0744	59.3329	59.5914	(39)

Average = Sum(39)m / 12 = 59.1713

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0893	1.0870	1.0846	1.0729	1.0706	1.0589	1.0589	1.0565	1.0635	1.0706	1.0753	1.0799	(40)
HLP (average)												1.0723	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)
Hot water usage for mixer showers

55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
										Total per year (kWh/year) = Sum(64)m =		2034.0749	(64)
12Total per year (kWh/year)												2034	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0292	89.7109	81.0292	83.7301	81.0292	83.7301	81.0292	81.0292	83.7301	81.0292	83.7301	81.0292	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)
Total internal gains	371.9017	380.1975	363.3598	348.4483	329.1482	315.6885	302.4900	303.6393	313.8432	326.2441	348.5447	363.7049	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(79)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)

Southwest			2.7200		36.7938		0.3300		0.0000		0.7700		25.4301 (79)
Solar gains	127.0572	216.4254	296.1226	366.9103	410.9701	407.9982	393.3538	360.4832	320.6382	239.1961	152.1852	108.7345	(83)
Total gains	498.9589	596.6229	659.4824	715.3586	740.1182	723.6867	695.8437	664.1224	634.4813	565.4402	500.7299	472.4394	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.4997	70.6516	70.8042	71.5772	71.7338	72.5273	72.5273	72.6881	72.2078	71.7338	71.4212	71.1114	
alpha	5.7000	5.7101	5.7203	5.7718	5.7823	5.8352	5.8352	5.8459	5.8139	5.7823	5.7614	5.7408	
util living area	0.9906	0.9746	0.9407	0.8529	0.7029	0.5114	0.3688	0.4026	0.6204	0.8855	0.9770	0.9929	(86)
MIT	20.0771	20.3038	20.5515	20.8071	20.9471	20.9929	20.9991	20.9985	20.9795	20.7935	20.3909	20.0348	(87)
Th 2	20.0096	20.0115	20.0134	20.0230	20.0249	20.0346	20.0346	20.0365	20.0307	20.0249	20.0211	20.0172	(88)
util rest of house	0.9874	0.9666	0.9230	0.8149	0.6421	0.4367	0.2882	0.3189	0.5409	0.8459	0.9684	0.9904	(89)
MIT 2	18.9600	19.2450	19.5481	19.8468	19.9863	20.0312	20.0343	20.0361	20.0193	19.8420	19.3648	18.9124	(90)
Living area fraction										fLA = Living area / (4) =		0.4984	(91)
MIT	19.5168	19.7727	20.0482	20.3254	20.4651	20.5105	20.5152	20.5157	20.4978	20.3162	19.8762	19.4718	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5168	19.7727	20.0482	20.3254	20.4651	20.5105	20.5152	20.5157	20.4978	20.3162	19.8762	19.4718	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9854	0.9643	0.9237	0.8275	0.6704	0.4738	0.3284	0.3607	0.5800	0.8589	0.9669	0.9887	(94)
Useful gains	491.6653	575.3168	609.1826	591.9288	496.1632	342.9142	228.5218	239.5436	368.0002	485.6379	484.1369	467.1050	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	914.6558	892.0527	810.8564	676.4246	517.7947	345.3380	228.7548	239.9428	375.4673	573.9768	758.0482	910.0679	(97)
Space heating kWh	314.7049	212.8466	150.0453	60.8370	16.0939	0.0000	0.0000	0.0000	0.0000	65.7241	197.2161	329.5644	(98a)
Space heating requirement - total per year (kWh/year)												1347.0323	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	314.7049	212.8466	150.0453	60.8370	16.0939	0.0000	0.0000	0.0000	0.0000	65.7241	197.2161	329.5644	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1347.0323	
Space heating per m2										(98c) / (4) =		24.4116	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	314.7049	212.8466	150.0453	60.8370	16.0939	0.0000	0.0000	0.0000	0.0000	65.7241	197.2161	329.5644	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	314.7049	212.8466	150.0453	60.8370	16.0939	0.0000	0.0000	0.0000	0.0000	65.7241	197.2161	329.5644	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.5935	8.6651	9.5935	9.2840	9.5935	9.2840	9.5935	9.5935	9.2840	9.5935	9.2840	9.5935	(231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1347.0323	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	324.5200	
Water heating fuel used	626.7949	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)		
mechanical ventilation fans (SFP = 0.6580)	112.9556	(230a)
Total electricity for the above, kWh/year	112.9556	(231)
Electricity for lighting (calculated in Appendix L)	133.1010	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2219.8838	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1347.0323	0.1571	211.5705	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			300.0307	(265)
Pumps, fans and electric keep-hot	112.9556	0.1387	15.6683	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			334.9096	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.0700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1347.0323	1.5814	2130.2383	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	1.5219	953.8959	(278)
Space and water heating			3084.1342	(279)
Pumps, fans and electric keep-hot	112.9556	1.5128	170.8792	(281)
Energy for lighting	133.1010	1.5338	204.1547	(282)
Total Primary energy kWh/year			3459.1681	(286)
Dwelling Primary energy Rate (DPER)			62.6900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b) x	2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.7090	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1421	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3921	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3333	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4250	0.4166	0.4083	0.3666	0.3583	0.3167	0.3167	0.3083	0.3333	0.3583	0.3750	0.3916	(22b)

Effective ac	0.5903	0.5868	0.5834	0.5672	0.5642	0.5501	0.5501	0.5475	0.5556	0.5642	0.5703	0.5767	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.7400	1.1450	13.4427			(27)
Exposed Floor			55.1800	0.1300	7.1734			(28b)
Brickwork	59.5600	11.7400	47.8200	0.1800	8.6076			(29a)
Communal Wall	15.5400	2.0600	13.4800	0.1800	2.4264			(29a)
Stairwell Wall	8.0400		8.0400	0.1800	1.4472			(29a)
Total net area of external elements Aum(A, m2)			138.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.1573			(33)
Main dwelling								
Party Wall 1			10.1600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.4674 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	55.6600	0.0700	3.8962
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.0200	0.0452
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	5.7000	0.0600	0.3420
E1 Steel lintel with perforated steel base plate	6.6700	0.0500	0.3335
E4 Jamb	23.9000	0.0500	1.1950
E5 Ground floor (normal)	42.1100	0.1600	6.7376

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.2335 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 48.3908 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.4101	27.2473	27.0877	26.3381	26.1978	25.5449	25.5449	25.4240	25.7964	26.1978	26.4815	26.7782	(38)
Heat transfer coeff	75.8010	75.6382	75.4786	74.7289	74.5887	73.9357	73.9357	73.8148	74.1872	74.5887	74.8724	75.1690	(39)

Average = Sum(39)m / 12 = 74.7282

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3737	1.3708	1.3679	1.3543	1.3517	1.3399	1.3399	1.3377	1.3445	1.3517	1.3569	1.3623	(40)
HLP (average)												1.3543	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)

Hot water usage for mixer showers

55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	

Distribution loss (46)m = 0.15 x (45)m

26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.6708	198.7794	211.2272	185.6408	179.9472	162.1236	159.8990	166.2009	167.9899	187.3702	199.3217	222.1905	(62)
WWHRS -25.1960	-22.2836	-23.3341	-19.3215	-18.0070	-15.4087	-14.4432	-15.3589	-15.9424	-18.7944	-21.2917	-24.7294	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

199.4748	176.4959	187.8932	166.3193	161.9403	146.7149	145.4558	150.8420	152.0474	168.5759	178.0300	197.4611	(64)
								Total per year (kWh/year) = Sum(64)m =			2031.2506	(64)

12Total per year (kWh/year) 2031 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

96.4862	85.7692	92.0162	82.8060	81.6156	74.9865	74.9495	77.0449	76.9371	84.0837	87.3549	95.6615	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.1824	89.8805	81.1824	83.8885	81.1824	83.8885	81.1824	81.1824	83.8885	81.1824	83.8885	81.1824	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)													
	129.6857	127.6328	123.6776	115.0084	109.6984	104.1480	100.7386	103.5550	106.8570	113.0158	121.3262	128.5772	(72)
Total internal gains													
	425.1570	433.4692	416.6151	401.7087	382.4035	365.9489	352.7452	353.8946	364.1036	379.4994	401.8051	416.9602	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.7100	36.7938	0.6300	0.7000	0.7700	52.9624	(77)
Southwest	7.0300	36.7938	0.6300	0.7000	0.7700	79.0501	(79)

Solar gains	132.0125	224.8661	307.6716	381.2200	426.9982	423.9103	408.6948	374.5422	333.1432	248.5249	158.1205	112.9752	(83)
Total gains	557.1695	658.3353	724.2866	782.9287	809.4016	789.8593	761.4400	728.4368	697.2468	628.0243	559.9256	529.9354	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.9047	56.0250	56.1435	56.7067	56.8133	57.3150	57.3150	57.4089	57.1207	56.8133	56.5980	56.3747	
alpha	4.7270	4.7350	4.7429	4.7804	4.7876	4.8210	4.8210	4.8273	4.8080	4.7876	4.7732	4.7583	
util living area													
	0.9883	0.9743	0.9473	0.8808	0.7579	0.5777	0.4232	0.4598	0.6812	0.9018	0.9753	0.9906	(86)
MIT	19.7643	20.0037	20.2939	20.6280	20.8609	20.9706	20.9946	20.9920	20.9359	20.6370	20.1431	19.7228	(87)
Th 2	19.7836	19.7858	19.7881	19.7986	19.8005	19.8097	19.8097	19.8114	19.8062	19.8005	19.7966	19.7924	(88)
util rest of house													
	0.9843	0.9657	0.9299	0.8429	0.6893	0.4797	0.3109	0.3443	0.5842	0.8617	0.9655	0.9873	(89)
MIT 2	18.3974	18.6986	19.0569	19.4550	19.6975	19.7957	19.8084	19.8092	19.7706	19.4778	18.8851	18.3513	(90)
Living area fraction									fLA = Living area / (4) =			0.4984	(91)
MIT	19.0786	19.3490	19.6734	20.0396	20.2773	20.3813	20.3996	20.3987	20.3513	20.0555	19.5121	19.0348	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0786	19.3490	19.6734	20.0396	20.2773	20.3813	20.3996	20.3987	20.3513	20.0555	19.5121	19.0348	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9811	0.9618	0.9279	0.8513	0.7182	0.5279	0.3670	0.4021	0.6305	0.8715	0.9626	0.9846	(94)
Useful gains	546.6626	633.2167	672.0581	666.5442	581.2899	416.9879	279.4702	292.9090	439.6461	547.3013	538.9779	521.7541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1120.2339	1092.8987	994.3097	832.4468	639.7692	427.4412	280.9232	295.1622	463.7690	705.2734	929.3219	1115.1177	(97)
Space heating kWh													
	426.7370	308.9063	239.7552	119.4499	43.5086	0.0000	0.0000	0.0000	0.0000	117.5312	281.0477	441.4625	(98a)
Space heating requirement - total per year (kWh/year)												1978.3984	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	426.7370	308.9063	239.7552	119.4499	43.5086	0.0000	0.0000	0.0000	0.0000	117.5312	281.0477	441.4625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1978.3984	
Space heating per m2											(98c) / (4) =	35.8535	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	426.7370	308.9063	239.7552	119.4499	43.5086	0.0000	0.0000	0.0000	0.0000	117.5312	281.0477	441.4625	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	462.3370	334.6764	259.7564	129.4149	47.1383	0.0000	0.0000	0.0000	0.0000	127.3361	304.4937	478.2909	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	199.4748	176.4959	187.8932	166.3193	161.9403	146.7149	145.4558	150.8420	152.0474	168.5759	178.0300	197.4611	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7204	85.3019	84.6075	83.3302	81.5504	79.8000	79.8000	79.8000	79.8000	83.2668	85.0789	85.8091	(217)
Fuel for water heating, kWh/month													
	232.7040	206.9073	222.0762	199.5906	198.5770	183.8533	182.2755	189.0251	190.5356	202.4528	209.2527	230.1168	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8681	13.5322	12.1843	8.9267	6.8952	5.6335	6.2901	8.1761	10.6199	13.9339	15.7383	17.3369	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.9352	-27.6450	-41.1459	-47.9752	-53.2440	-50.2762	-49.6849	-46.1683	-40.2014	-32.3911	-21.1603	-16.2633	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-7.9963	-17.0701	-34.3843	-52.3058	-69.7954	-70.3350	-69.4835	-58.5226	-42.5058	-24.6039	-10.7403	-6.3031	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2143.4436	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2447.3669	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	136.1352	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-909.1366	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3903.8092	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2143.4436	0.2100	450.1232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2447.3669	0.2100	513.9471	(264)
Space and water heating			964.0702	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.1352	0.1443	19.6485	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-445.0905	0.1338	-59.5685	
PV Unit electricity exported	-464.0461	0.1255	-58.2526	
Total			-117.8211	(269)
Total CO2, kg/year			877.8269	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2143.4436	1.1300	2422.0913	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2447.3669	1.1300	2765.5246	(278)
Space and water heating			5187.6159	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.1352	1.5338	208.8088	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-445.0905	1.4946	-665.2265	
PV Unit electricity exported	-464.0461	0.4608	-213.8196	
Total			-879.0461	(283)
Total Primary energy kWh/year			4647.4793	(286)
Target Primary Energy Rate (TPER)			84.2200	(287)

Full SAP Calculation Printout

Plot Reference	P-03	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-03
Plot Address	Flat 3, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	80 C	**DER**	6.07	**TER**	15.88
Environmental	96 A	**% DER < TER**			61.78
CO_2 Emissions (t/year)	0.27	**DFEE**	41.98	**TFEE**	44.58
Compliance Check	See BREL	**% DFEE < TFEE**			5.83
% DPER < TPER	25.43	**DPER**	62.69	**TPER**	84.07

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.7090	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6200	(17)
Infiltration rate		0.1310	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1114	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1420	0.1392	0.1364	0.1225	0.1197	0.1058	0.1058	0.1030	0.1114	0.1197	0.1253	0.1308	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

Effective ac	0.2780	0.2752	0.2724	0.2585	0.2557	0.2418	0.2418	0.2390	0.2474	0.2557	0.2613	0.2668	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Exposed Floor			55.1800	0.1200	6.6216	75.0000	4138.5000	(28b)
Brickwork	59.5600	13.5900	45.9700	0.2100	9.6537	110.0000	5056.7002	(29a)
Communal Wall	15.5400	2.0600	13.4800	0.2200	2.9656	110.0000	1482.8000	(29a)
Stairwell Wall	8.0400		8.0400	0.1600	1.2864	110.0000	884.4000	(29a)
Total net area of external elements Aum(A, m2)			138.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.5604			(33)
Main dwelling								
Party Wall 1			10.1600	0.0000	0.0000	110.0000	1117.6000	(32)
Party Ceiling 1			55.1800			30.0000	1655.4000	(32b)
Internal Wall 1			102.2300			9.0000	920.0700	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15255.4702	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.4674 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	55.6600	0.0380	2.1151
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.7000	0.0500	0.3335
E4 Jamb	23.9000	0.0160	0.3824
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.6408 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.2012 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9073	12.7780	12.6488	12.0025	11.8732	11.2269	11.2269	11.0977	11.4854	11.8732	12.1317	12.3903	(38)
Heat transfer coeff	60.1085	59.9792	59.8500	59.2037	59.0744	58.4281	58.4281	58.2988	58.6866	59.0744	59.3329	59.5914	(39)
Average = Sum(39)m / 12 =												59.1713	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0893	1.0870	1.0846	1.0729	1.0706	1.0589	1.0589	1.0565	1.0635	1.0706	1.0753	1.0799	(40)
HLP (average)												1.0723	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)
Hot water usage for mixer showers

55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
										Total per year (kWh/year) = Sum(64)m =		2034.0749	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8418	16.7351	13.6099	10.3036	7.7021	6.5024	7.0261	9.1328	12.2580	15.5643	18.1658	19.3655	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.7752	242.2633	235.9934	222.6453	205.7958	189.9597	179.3802	176.8921	183.1620	196.5101	213.3596	229.1957	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)
Total internal gains	422.9518	421.2803	407.9299	382.6063	357.8453	335.2591	321.7939	324.2288	336.9260	359.7391	387.5006	411.7874	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(79)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Southwest	2.7200	36.7938	0.3300	0.0000	0.7700	25.4301	(79)

Solar gains	127.0572	216.4254	296.1226	366.9103	410.9701	407.9982	393.3538	360.4832	320.6382	239.1961	152.1852	108.7345	(83)
Total gains	550.0089	637.7056	704.0525	749.5166	768.8153	743.2572	715.1477	684.7120	657.5642	598.9353	539.6858	520.5219	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.4997	70.6516	70.8042	71.5772	71.7338	72.5273	72.5273	72.6881	72.2078	71.7338	71.4212	71.1114	
alpha	5.7000	5.7101	5.7203	5.7718	5.7823	5.8352	5.8352	5.8459	5.8139	5.7823	5.7614	5.7408	
util living area	0.9851	0.9661	0.9244	0.8324	0.6820	0.4985	0.3589	0.3907	0.6012	0.8632	0.9682	0.9886	(86)
MIT	20.1633	20.3667	20.6067	20.8320	20.9545	20.9938	20.9992	20.9988	20.9825	20.8231	20.4513	20.1174	(87)
Th 2	20.0096	20.0115	20.0134	20.0230	20.0249	20.0346	20.0346	20.0365	20.0307	20.0249	20.0211	20.0172	(88)
util rest of house	0.9803	0.9560	0.9034	0.7920	0.6214	0.4255	0.2805	0.3094	0.5231	0.8197	0.9568	0.9849	(89)
MIT 2	19.0681	19.3217	19.6116	19.8718	19.9922	20.0316	20.0344	20.0361	20.0211	19.8715	19.4381	19.0166	(90)
Living area fraction										fLA = Living area / (4) =		0.4984	(91)
MIT	19.6139	19.8425	20.1075	20.3503	20.4718	20.5111	20.5152	20.5159	20.5002	20.3457	19.9430	19.5652	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6139	19.8425	20.1075	20.3503	20.4718	20.5111	20.5152	20.5159	20.5002	20.3457	19.9430	19.5652	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9540	0.9056	0.8064	0.6499	0.4618	0.3196	0.3499	0.5616	0.8352	0.9557	0.9828	(94)
Useful gains	537.8662	608.3681	637.5955	604.3763	499.6530	343.2525	228.5580	239.6113	369.2586	500.2245	515.7902	511.5459	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	920.4946	896.2369	814.4096	677.9025	518.1872	345.3757	228.7592	239.9509	375.6075	575.7229	762.0150	915.6339	(97)
Space heating kWh	284.6755	193.4478	131.5497	52.9389	13.7895	0.0000	0.0000	0.0000	0.0000	56.1708	177.2819	300.6415	(98a)
Space heating requirement - total per year (kWh/year)												1210.4956	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	284.6755	193.4478	131.5497	52.9389	13.7895	0.0000	0.0000	0.0000	0.0000	56.1708	177.2819	300.6415	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1210.4956	
Space heating per m2											(98c) / (4) =	21.9372	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	284.6755	193.4478	131.5497	52.9389	13.7895	0.0000	0.0000	0.0000	0.0000	56.1708	177.2819	300.6415	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	284.6755	193.4478	131.5497	52.9389	13.7895	0.0000	0.0000	0.0000	0.0000	56.1708	177.2819	300.6415	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.5935	8.6651	9.5935	9.2840	9.5935	9.2840	9.5935	9.5935	9.2840	9.5935	9.2840	9.5935	(231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1210.4956	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	626.7949	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)		
mechanical ventilation fans (SFP = 0.6580)	112.9556	(230a)
Total electricity for the above, kWh/year	112.9556	(231)
Electricity for lighting (calculated in Appendix L)	133.1010	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2083.3471	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1210.4956	16.4900	199.6107	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	16.4900	103.3585	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	112.9556	16.4900	18.6264	(249)
Energy for lighting	133.1010	16.4900	21.9484	(250)
Additional standing charges			0.0000	(251)
Total energy cost			343.5439	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2345	(257)
SAP value		79.9882	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1210.4956	0.1572	190.2847	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			278.7449	(265)
Pumps, fans and electric keep-hot	112.9556	0.1387	15.6683	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			313.6238	(272)
CO2 emissions per m2			5.6800	(273)
EI value			95.8050	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b) x	2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.7090	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes

Pressure Test Method	Blower Door	
Measured/design AP50	2.6200	(17)
Infiltration rate	0.1310	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1114	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1197	0.1141	0.1141	0.1058	0.1086	0.0946	0.0946	0.0919	0.0946	0.1058	0.1030	0.1114	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2557	0.2501	0.2501	0.2418	0.2446	0.2306	0.2306	0.2279	0.2306	0.2418	0.2390	0.2474	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Exposed Floor			55.1800	0.1200	6.6216	75.0000	4138.5000	(28b)
Brickwork	59.5600	13.5900	45.9700	0.2100	9.6537	110.0000	5056.7002	(29a)
Communal Wall	15.5400	2.0600	13.4800	0.2200	2.9656	110.0000	1482.8000	(29a)
Stairwell Wall	8.0400		8.0400	0.1600	1.2864	110.0000	884.4000	(29a)
Total net area of external elements Aum(A, m2)			138.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.5604			(33)
Main dwelling								
Party Wall 1			10.1600	0.0000	0.0000	110.0000	1117.6000	(32)
Party Ceiling 1			55.1800			30.0000	1655.4000	(32b)
Internal Wall 1			102.2300			9.0000	920.0700	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	15255.4702	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	276.4674	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	55.6600	0.0380	2.1151
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.6700	0.0500	0.3335
E4 Jamb	23.9000	0.0160	0.3824
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.6408	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	47.2012	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.8732	11.6147	11.6147	11.2269	11.3562	10.7099	10.7099	10.5806	10.7099	11.2269	11.0977	11.4854	(38)
Heat transfer coeff	59.0744	58.8159	58.8159	58.4281	58.5574	57.9110	57.9110	57.7818	57.9110	58.4281	58.2988	58.6866	(39)
Average = Sum(39)m / 12 =												58.3850	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0706	1.0659	1.0659	1.0589	1.0612	1.0495	1.0495	1.0472	1.0495	1.0589	1.0565	1.0635	(40)
HLP (average)												1.0581	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8426	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day)	103.3574	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470 (64)
Total per year (kWh/year) = Sum(64)m =												2034.0749 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)

Heat gains from water heating, kWh/month

	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.8418	16.7351	13.6099	10.3036	7.7021	6.5024	7.0261	9.1328	12.2580	15.5643	18.1658	19.3655	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	239.7752	242.2633	235.9934	222.6453	205.7958	189.9597	179.3802	176.8921	183.1620	196.5101	213.3596	229.1957	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)

Water heating gains (Table 5)

	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)

Total internal gains

	422.9518	421.2803	407.9299	382.6063	357.8453	335.2591	321.7939	324.2288	336.9260	359.7391	387.5006	411.7874	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(79)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
Southwest	2.7200	43.0593	0.3300	0.0000	0.7700	29.7605	(79)

Solar gains	148.6931	221.2497	301.0792	380.8523	418.1079	440.3356	419.8178	392.4650	348.1590	262.5340	175.4126	128.0207	(83)
Total gains	571.6449	642.5300	709.0092	763.4586	775.9531	775.5947	741.6116	716.6938	685.0850	622.2731	562.9132	539.8081	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.7338	72.0491	72.0491	72.5273	72.3672	73.1748	73.1748	73.3385	73.1748	72.5273	72.6881	72.2078	
alpha	5.7823	5.8033	5.8033	5.8352	5.8245	5.8783	5.8783	5.8892	5.8783	5.8352	5.8459	5.8139	
util living area													
	0.9770	0.9550	0.8992	0.7760	0.5973	0.3874	0.2576	0.2740	0.5025	0.8008	0.9480	0.9821	(86)
MIT	20.3082	20.4794	20.7048	20.8979	20.9802	20.9987	20.9999	20.9999	20.9942	20.8967	20.5916	20.2669	(87)
Th 2	20.0249	20.0288	20.0288	20.0346	20.0326	20.0423	20.0423	20.0442	20.0423	20.0346	20.0365	20.0307	(88)
util rest of house													
	0.9697	0.9415	0.8721	0.7277	0.5314	0.3165	0.1829	0.1970	0.4246	0.7453	0.9300	0.9762	(89)
MIT 2	19.2617	19.4740	19.7384	19.9490	20.0202	20.0418	20.0423	20.0442	20.0397	19.9531	19.6200	19.2154	(90)
Living area fraction									fLA = Living area / (4) =			0.4984	(91)
MIT	19.7833	19.9750	20.2200	20.4219	20.4987	20.5187	20.5195	20.5205	20.5154	20.4233	20.1042	19.7394	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7833	19.9750	20.2200	20.4219	20.4987	20.5187	20.5195	20.5205	20.5154	20.4233	20.1042	19.7394	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9407	0.8779	0.7479	0.5636	0.3518	0.2201	0.2354	0.4634	0.7689	0.9314	0.9740	(94)
Useful gains	553.0594	604.4237	622.4588	570.9838	437.3467	272.8808	163.2647	168.7248	317.4694	478.4535	524.3166	525.7559	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	867.4041	839.5994	754.0209	614.7767	444.9582	273.2655	163.2822	168.7506	319.4008	521.3733	705.6614	859.1393	(97)
Space heating kWh													
	233.8725	158.0381	97.8822	31.5309	5.6630	0.0000	0.0000	0.0000	0.0000	31.9324	130.5682	248.0372	(98a)
Space heating requirement - total per year (kWh/year)												937.5244	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	233.8725	158.0381	97.8822	31.5309	5.6630	0.0000	0.0000	0.0000	0.0000	31.9324	130.5682	248.0372	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												937.5244	
Space heating per m2											(98c) / (4) =	16.9903	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	233.8725	158.0381	97.8822	31.5309	5.6630	0.0000	0.0000	0.0000	0.0000	31.9324	130.5682	248.0372	(98)

Space heating efficiency (main heating system 1)

100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)

233.8725	158.0381	97.8822	31.5309	5.6630	0.0000	0.0000	0.0000	0.0000	31.9324	130.5682	248.0372	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)

Efficiency of water heater 324.5200 (216)

(217)m 324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)

Fuel for water heating, kWh/month

63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 9.5935	8.6651	9.5935	9.2840	9.5935	9.2840	9.5935	9.5935	9.2840	9.5935	9.2840	9.5935	(231)
Lighting 16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 937.5244 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 626.7949 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)
mechanical ventilation fans (SFP = 0.6580) 112.9556 (230a)
Total electricity for the above, kWh/year 112.9556 (231)
Electricity for lighting (calculated in Appendix L) 133.1010 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1810.3759 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	937.5244	27.6700	259.4130	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	27.6700	173.4342	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	112.9556	27.6700	31.2548	(249)
Energy for lighting	133.1010	27.6700	36.8290	(250)
Additional standing charges			0.0000	(251)
Total energy cost			500.9310	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	937.5244	0.1580	148.1284	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			236.5886	(265)
Pumps, fans and electric keep-hot	112.9556	0.1387	15.6683	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			271.4675	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	937.5244	1.5849	1485.8640	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	1.5219	953.8959	(278)
Space and water heating			2439.7599	(279)
Pumps, fans and electric keep-hot	112.9556	1.5128	170.8792	(281)
Energy for lighting	133.1010	1.5338	204.1547	(282)
Total Primary energy kWh/year			2814.7938	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 80
Current environmental impact rating: A 96

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 80
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£501	£501	£0
Space heating	£291	£291	£0
Water heating	£173	£173	£0
Lighting	£37	£37	£0
Total cost of fuels	£501	£501	£0
Total cost of uses	£501	£501	£0
Delivered energy	33 kWh/m²	33 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	51 kWh/m²	51 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800 (1b)	x	2.5500 (2b)	=	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.7090	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.6200 (17)
Infiltration rate		0.1310 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1114 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1420	0.1392	0.1364	0.1225	0.1197	0.1058	0.1058	0.1030	0.1114	0.1197	0.1253	0.1308	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2780	0.2752	0.2724	0.2585	0.2557	0.2418	0.2418	0.2390	0.2474	0.2557	0.2613	0.2668	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Exposed Floor			55.1800	0.1200	6.6216	75.0000	4138.5000	(28b)
Brickwork	59.5600	13.5900	45.9700	0.2100	9.6537	110.0000	5056.7002	(29a)
Communal Wall	15.5400	2.0600	13.4800	0.2200	2.9656	110.0000	1482.8000	(29a)
Stairwell Wall	8.0400		8.0400	0.1600	1.2864	110.0000	884.4000	(29a)
Total net area of external elements Aum(A, m2)			138.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.5604			(33)
Main dwelling								
Party Wall 1			10.1600	0.0000	0.0000	110.0000	1117.6000	(32)
Party Ceiling 1			55.1800			30.0000	1655.4000	(32b)
Internal Wall 1			102.2300			9.0000	920.0700	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15255.4702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.4674 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	55.6600	0.0380	2.1151
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.6700	0.0500	0.3335
E4 Jamb	23.9000	0.0160	0.3824
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.6408 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.2012 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9073	12.7780	12.6488	12.0025	11.8732	11.2269	11.2269	11.0977	11.4854	11.8732	12.1317	12.3903	(38)
Heat transfer coeff	60.1085	59.9792	59.8500	59.2037	59.0744	58.4281	58.4281	58.2988	58.6866	59.0744	59.3329	59.5914	(39)
Average = Sum(39)m / 12 =												59.1713	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0893	1.0870	1.0846	1.0729	1.0706	1.0589	1.0589	1.0565	1.0635	1.0706	1.0753	1.0799	(40)
HLP (average)												1.0723	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)
Hot water usage for mixer showers

55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
									Total per year (kWh/year) = Sum(64)m =			2034.0749	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
18.8418 16.7351 13.6099 10.3036 7.7021 6.5024 7.0261 9.1328 12.2580 15.5643 18.1658 19.3655 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
239.7752 242.2633 235.9934 222.6453 205.7958 189.9597 179.3802 176.8921 183.1620 196.5101 213.3596 229.1957 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
47.8984 47.8984 47.8984 47.8984 47.8984 47.8984 47.8984 47.8984 47.8984 47.8984 47.8984 47.8984 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-73.7053 -73.7053 -73.7053 -73.7053 -73.7053 -73.7053 -73.7053 -73.7053 -73.7053 -73.7053 -73.7053 -73.7053 (71)
Water heating gains (Table 5)
79.5837 77.5307 73.5756 64.9063 59.5963 54.0459 50.6366 53.4529 56.7550 62.9137 71.2242 78.4752 (72)
Total internal gains
422.9518 421.2803 407.9299 382.6063 357.8453 335.2591 321.7939 324.2288 336.9260 359.7391 387.5006 411.7874 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(79)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Southwest	2.7200	36.7938	0.3300	0.0000	0.7700	25.4301	(79)

Solar gains 127.0572 216.4254 296.1226 366.9103 410.9701 407.9982 393.3538 360.4832 320.6382 239.1961 152.1852 108.7345 (83)
Total gains 550.0089 637.7056 704.0525 749.5166 768.8153 743.2572 715.1477 684.7120 657.5642 598.9353 539.6858 520.5219 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.4997	70.6516	70.8042	71.5772	71.7338	72.5273	72.5273	72.6881	72.2078	71.7338	71.4212	71.1114	
alpha	5.7000	5.7101	5.7203	5.7718	5.7823	5.8352	5.8352	5.8459	5.8139	5.7823	5.7614	5.7408	
util living area	0.9851	0.9661	0.9244	0.8324	0.6820	0.4985	0.3589	0.3907	0.6012	0.8632	0.9682	0.9886	(86)
MIT	20.1633	20.3667	20.6067	20.8320	20.9545	20.9938	20.9992	20.9988	20.9825	20.8231	20.4513	20.1174	(87)
Th 2	20.0096	20.0115	20.0134	20.0230	20.0249	20.0346	20.0346	20.0365	20.0307	20.0249	20.0211	20.0172	(88)
util rest of house	0.9803	0.9560	0.9034	0.7920	0.6214	0.4255	0.2805	0.3094	0.5231	0.8197	0.9568	0.9849	(89)
MIT 2	19.0681	19.3217	19.6116	19.8718	19.9922	20.0316	20.0344	20.0361	20.0211	19.8715	19.4381	19.0166	(90)
Living area fraction										fLA = Living area / (4) =		0.4984	(91)
MIT	19.6139	19.8425	20.1075	20.3503	20.4718	20.5111	20.5152	20.5159	20.5002	20.3457	19.9430	19.5652	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6139	19.8425	20.1075	20.3503	20.4718	20.5111	20.5152	20.5159	20.5002	20.3457	19.9430	19.5652	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9540	0.9056	0.8064	0.6499	0.4618	0.3196	0.3499	0.5616	0.8352	0.9557	0.9828	(94)
Useful gains	537.8662	608.3681	637.5955	604.3763	499.6530	343.2525	228.5580	239.6113	369.2586	500.2245	515.7902	511.5459	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	920.4946	896.2369	814.4096	677.9025	518.1872	345.3757	228.7592	239.9509	375.6075	575.7229	762.0150	915.6339	(97)
Space heating kWh	284.6755	193.4478	131.5497	52.9389	13.7895	0.0000	0.0000	0.0000	0.0000	56.1708	177.2819	300.6415	(98a)
Space heating requirement - total per year (kWh/year)												1210.4956	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	284.6755	193.4478	131.5497	52.9389	13.7895	0.0000	0.0000	0.0000	0.0000	56.1708	177.2819	300.6415	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1210.4956	
Space heating per m2											(98c) / (4) =	21.9372	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	284.6755	193.4478	131.5497	52.9389	13.7895	0.0000	0.0000	0.0000	0.0000	56.1708	177.2819	300.6415	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	284.6755	193.4478	131.5497	52.9389	13.7895	0.0000	0.0000	0.0000	0.0000	56.1708	177.2819	300.6415	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)

Fuel for water heating, kWh/month

	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	9.5935	8.6651	9.5935	9.2840	9.5935	9.2840	9.5935	9.5935	9.2840	9.5935	9.2840	9.5935 (231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1210.4956	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	626.7949	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)		
mechanical ventilation fans (SFP = 0.6580)	112.9556	(230a)
Total electricity for the above, kWh/year	112.9556	(231)
Electricity for lighting (calculated in Appendix L)	133.1010	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2083.3471	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1210.4956	16.4900	199.6107	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	16.4900	103.3585	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	112.9556	16.4900	18.6264	(249)
Energy for lighting	133.1010	16.4900	21.9484	(250)
Additional standing charges			0.0000	(251)
Total energy cost			343.5439	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2345	(257)
SAP value		79.9882	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1210.4956	0.1572	190.2847	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			278.7449	(265)
Pumps, fans and electric keep-hot	112.9556	0.1387	15.6683	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			313.6238	(272)
CO2 emissions per m2			5.6800	(273)
EI value			95.8050	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.7090	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6200	(17)
Infiltration rate		0.1310	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1114	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1197	0.1141	0.1141	0.1058	0.1086	0.0946	0.0946	0.0919	0.0946	0.1058	0.1030	0.1114	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2557	0.2501	0.2501	0.2418	0.2446	0.2306	0.2306	0.2279	0.2306	0.2418	0.2390	0.2474	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Exposed Floor			55.1800	0.1200	6.6216	75.0000	4138.5000	(28b)
Brickwork	59.5600	13.5900	45.9700	0.2100	9.6537	110.0000	5056.7002	(29a)
Communal Wall	15.5400	2.0600	13.4800	0.2200	2.9656	110.0000	1482.8000	(29a)
Stairwell Wall	8.0400		8.0400	0.1600	1.2864	110.0000	884.4000	(29a)
Total net area of external elements Aum(A, m2)			138.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.5604			(33)
Main dwelling								
Party Wall 1			10.1600	0.0000	0.0000	110.0000	1117.6000	(32)
Party Ceiling 1			55.1800			30.0000	1655.4000	(32b)
Internal Wall 1			102.2300			9.0000	920.0700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15255.4702	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	276.4674	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	55.6600	0.0380	2.1151
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.6700	0.0500	0.3335
E4 Jamb	23.9000	0.0160	0.3824
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.6408	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	47.2012	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.8732	11.6147	11.6147	11.2269	11.3562	10.7099	10.7099	10.5806	10.7099	11.2269	11.0977	11.4854	(38)
Heat transfer coeff	59.0744	58.8159	58.8159	58.4281	58.5574	57.9110	57.9110	57.7818	57.9110	58.4281	58.2988	58.6866	(39)
Average = Sum(39)m / 12 =												58.3850	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0706	1.0659	1.0659	1.0589	1.0612	1.0495	1.0495	1.0472	1.0495	1.0589	1.0565	1.0635	(40)
HLP (average)												1.0581	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8426	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)
Hot water usage for baths	23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)
Hot water usage for other uses													

	33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004 (42c)
Average daily hot water use (litres/day)												103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m													
	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
										Total per year (kWh/year) = Sum(64)m =		2034.0749	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.8418	16.7351	13.6099	10.3036	7.7021	6.5024	7.0261	9.1328	12.2580	15.5643	18.1658	19.3655	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	239.7752	242.2633	235.9934	222.6453	205.7958	189.9597	179.3802	176.8921	183.1620	196.5101	213.3596	229.1957	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)													
	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)
Total internal gains													
	422.9518	421.2803	407.9299	382.6063	357.8453	335.2591	321.7939	324.2288	336.9260	359.7391	387.5006	411.7874	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(79)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
Southwest	2.7200	43.0593	0.3300	0.0000	0.7700	29.7605	(79)

Solar gains	148.6931	221.2497	301.0792	380.8523	418.1079	440.3356	419.8178	392.4650	348.1590	262.5340	175.4126	128.0207	(83)
Total gains	571.6449	642.5300	709.0092	763.4586	775.9531	775.5947	741.6116	716.6938	685.0850	622.2731	562.9132	539.8081	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.7338	72.0491	72.0491	72.5273	72.3672	73.1748	73.1748	73.3385	73.1748	72.5273	72.6881	72.2078	
alpha	5.7823	5.8033	5.8033	5.8352	5.8245	5.8783	5.8783	5.8892	5.8783	5.8352	5.8459	5.8139	
util living area													
	0.9770	0.9550	0.8992	0.7760	0.5973	0.3874	0.2576	0.2740	0.5025	0.8008	0.9480	0.9821	(86)
MIT	20.3082	20.4794	20.7048	20.8979	20.9802	20.9987	20.9999	20.9999	20.9942	20.8967	20.5916	20.2669	(87)
Th 2	20.0249	20.0288	20.0288	20.0346	20.0326	20.0423	20.0423	20.0442	20.0423	20.0346	20.0365	20.0307	(88)
util rest of house													
	0.9697	0.9415	0.8721	0.7277	0.5314	0.3165	0.1829	0.1970	0.4246	0.7453	0.9300	0.9762	(89)
MIT 2	19.2617	19.4740	19.7384	19.9490	20.0202	20.0418	20.0423	20.0442	20.0397	19.9531	19.6200	19.2154	(90)
Living area fraction										fLA = Living area / (4) =		0.4984	(91)
MIT	19.7833	19.9750	20.2200	20.4219	20.4987	20.5187	20.5195	20.5205	20.5154	20.4233	20.1042	19.7394	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7833	19.9750	20.2200	20.4219	20.4987	20.5187	20.5195	20.5205	20.5154	20.4233	20.1042	19.7394	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9407	0.8779	0.7479	0.5636	0.3518	0.2201	0.2354	0.4634	0.7689	0.9314	0.9740	(94)
Useful gains	553.0594	604.4237	622.4588	570.9838	437.3467	272.8808	163.2647	168.7248	317.4694	478.4535	524.3166	525.7559	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	867.4041	839.5994	754.0209	614.7767	444.9582	273.2655	163.2822	168.7506	319.4008	521.3733	705.6614	859.1393	(97)
Space heating kWh													

	233.8725	158.0381	97.8822	31.5309	5.6630	0.0000	0.0000	0.0000	0.0000	31.9324	130.5682	248.0372 (98a)
Space heating requirement - total per year (kWh/year)												937.5244
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	233.8725	158.0381	97.8822	31.5309	5.6630	0.0000	0.0000	0.0000	0.0000	31.9324	130.5682	248.0372 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												937.5244
Space heating per m2											(98c) / (4) =	16.9903 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	233.8725	158.0381	97.8822	31.5309	5.6630	0.0000	0.0000	0.0000	0.0000	31.9324	130.5682	248.0372	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	233.8725	158.0381	97.8822	31.5309	5.6630	0.0000	0.0000	0.0000	0.0000	31.9324	130.5682	248.0372	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.5935	8.6651	9.5935	9.2840	9.5935	9.2840	9.5935	9.5935	9.2840	9.5935	9.2840	9.5935	(231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	937.5244 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	626.7949 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)	
mechanical ventilation fans (SFP = 0.6580)	112.9556 (230a)
Total electricity for the above, kWh/year	112.9556 (231)
Electricity for lighting (calculated in Appendix L)	133.1010 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1810.3759 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	937.5244	27.6700	259.4130	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	27.6700	173.4342	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	112.9556	27.6700	31.2548	(249)
Energy for lighting	133.1010	27.6700	36.8290	(250)
Additional standing charges			0.0000	(251)
Total energy cost			500.9310	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	937.5244	0.1580	148.1284	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			236.5886	(265)
Pumps, fans and electric keep-hot	112.9556	0.1387	15.6683	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			271.4675	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	937.5244	1.5849	1485.8640	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	1.5219	953.8959	(278)
Space and water heating			2439.7599	(279)
Pumps, fans and electric keep-hot	112.9556	1.5128	170.8792	(281)
Energy for lighting	133.1010	1.5338	204.1547	(282)
Total Primary energy kWh/year			2814.7938	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-04	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-04
Plot Address	Flat 4, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	7.48	**TER**	16.48
Environmental	94 A	**% DER < TER**			54.61
CO_2 Emissions (t/year)	0.48	**DFEE**	52.13	**TFEE**	52.29
Compliance Check	See BREL	**% DFEE < TFEE**			0.30
% DPER < TPER	12.06	**DPER**	76.97	**TPER**	87.52

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	287.41	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	42.11 m	77.27 m²	2.55 m

8.0 Living Area	30.57	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	98.44	73.97	0.00	None	24.47	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	17.47	15.32	0.50	Stairwell Access Corridor 1	2.15	Enter Gross Area
Lift Shaft	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.76	6.76	0.00	None	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	12.15	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	141.81

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Terrace Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	29.33	29.33	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	47.94

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	77.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-GBY	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	South West	2.15	
Patio Door	Window-Red	Brickwork	North East	6.50	
East	Window-Red	Brickwork	North East	10.33	
North	Window-Red	Brickwork	North West	2.18	
South	Window-GBY	Brickwork	South East	5.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	54.31	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	17.11	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	8.55	-0.10	-0.10	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.40	0.33	0.33	AbbeyCalculated	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	7.66	0.00	0.00		No
E18 Party wall between dwellings	Gov Approved Scheme	2.85	0.04	0.04	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No
E15 Flat roof with parapet	Table K1 - Default	18.66	0.30	0.30		No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	2.59	0.06	0.06	RCD	No
E1 Steel lintel with perforated steel base plate	Independently assessed	11.22	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	37.80	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	42.11	0.11	0.11	RCD	No

Y-value	0.10	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	3
Manufacturer SFP	0.54
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	3
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.99	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	8
Downlight	85.00	10.00	850.00	14

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No

Summary for Input Data

Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-04	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-04
Plot Address	Flat 4, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	7.48	**TER**	16.48
Environmental	94 A	**% DER < TER**			54.61
CO_2 Emissions (t/year)	0.48	**DFEE**	52.13	**TFEE**	52.29
Compliance Check	See BREL	**% DFEE < TFEE**			0.30
% DPER < TPER	12.06	**DPER**	76.97	**TPER**	87.52

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.2700	(1b)	x 2.5500	(2b) =	197.0385	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	197.0385	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9900	(17)
Infiltration rate		0.1495	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1271	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1620	0.1588	0.1557	0.1398	0.1366	0.1207	0.1207	0.1175	0.1271	0.1366	0.1430	0.1493	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		71.2000 (23c)

Effective ac	0.3060	0.3028	0.2997	0.2838	0.2806	0.2647	0.2647	0.2615	0.2711	0.2806	0.2870	0.2933	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	98.4400	24.4600	73.9800	0.2100	15.5358	110.0000	8137.8003	(29a)
Communal Wall	17.4700	2.1500	15.3200	0.2200	3.3704	110.0000	1685.1999	(29a)
Lift Shaft	6.7600		6.7600	0.2500	1.6900	110.0000	743.6000	(29a)
Terrace Roof	29.3300		29.3300	0.1300	3.8129	9.0000	263.9700	(30)
Total net area of external elements Aum(A, m2)			152.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.7210			(33)
Main dwelling								
Party Wall 1			12.1500	0.0000	0.0000	110.0000	1336.5000	(32)
Party Floor 1			77.2700			70.0000	5408.9000	(32d)
Party Ceiling 1			47.9400			30.0000	1438.2000	(32b)
Internal Wall 1			141.8100			9.0000	1276.2900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20290.4602	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		262.5917	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	54.3100	0.0380	2.0638
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P2 Party wall - Intermediate floor within a dwelling	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E15 Flat roof with parapet	18.6600	0.3000	5.5980
E10 Eaves (insulation at ceiling level)	2.5900	0.0630	0.1632
E1 Steel lintel with perforated steel base plate	11.2200	0.0500	0.5610
E4 Jamb	37.8000	0.0160	0.6048
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.4503	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	72.1713	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8983	19.6917	19.4851	18.4523	18.2457	17.2129	17.2129	17.0063	17.6260	18.2457	18.6589	19.0720	(38)
Heat transfer coeff	92.0696	91.8630	91.6565	90.6236	90.4170	89.3842	89.3842	89.1776	89.7973	90.4170	90.8302	91.2433	(39)
Average = Sum(39)m / 12 =												90.5720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1915	1.1889	1.1862	1.1728	1.1701	1.1568	1.1568	1.1541	1.1621	1.1701	1.1755	1.1808	(40)
HLP (average)												1.1721	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4090 (42)
Hot water usage for mixer showers	64.6110	63.6401	62.2252	59.5180	57.5202	55.2922	54.0259	55.4300	56.9693	59.3615	62.1268	64.3635 (42a)
Hot water usage for baths	27.9081	27.4936	26.9099	25.8338	25.0279	24.1344	23.6518	24.2313	24.8624	25.8185	26.9169	27.8137 (42b)
Hot water usage for other uses	39.3008	37.8717	36.4425	35.0134	33.5843	32.1552	32.1552	33.5843	35.0134	36.4425	37.8717	39.3008 (42c)
Average daily hot water use (litres/day)												121.1724 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.8199	129.0053	125.5776	120.3652	116.1324	111.5818	109.8328	113.2457	116.8451	121.6225	126.9153	131.4780	(44)
Energy conte	208.7705	183.7019	193.0082	164.7739	156.3366	137.2029	132.8333	140.2218	144.0817	165.0406	180.8141	205.8628	(45)
Energy content (annual)										Total = Sum(45)m =		2012.6482	
Distribution loss (46)m = 0.15 x (45)m	31.3156	27.5553	28.9512	24.7161	23.4505	20.5804	19.9250	21.0333	21.6123	24.7561	27.1221	30.8794	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)
									Total per year (kWh/year) = Sum(64)m =			2329.9792	(64)
12Total per year (kWh/year)												2330	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	69.4162	61.0809	64.1752	54.7873	51.9819	45.6199	44.1671	46.6238	47.9072	54.8760	60.1207	68.4494	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.7571	119.3025	107.7571	111.3490	107.7571	111.3490	107.7571	107.7571	111.3490	107.7571	111.3490	107.7571	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.6404	215.8573	210.2708	198.3776	183.3647	169.2546	159.8283	157.6113	163.1979	175.0910	190.1040	204.2140	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	(71)
Water heating gains (Table 5)	93.3013	90.8942	86.2570	76.0935	69.8682	63.3610	59.3643	62.6663	66.5377	73.7581	83.5010	92.0019	(72)
Total internal gains	473.8341	485.1893	463.4201	444.9554	420.1252	403.0999	386.0849	387.1700	400.2199	415.7415	444.0892	463.1082	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Southeast			5.4500		36.7938		0.3300		0.0000		0.7700		50.9538 (77)
Northeast			16.8300		11.2829		0.3100		0.0000		0.7700		45.3272 (75)
Northwest			2.1800		11.2829		0.3100		0.0000		0.7700		5.8713 (81)
Solar gains	102.1522	191.0090	306.5181	455.5045	579.3109	605.5200	571.1355	474.1229	357.3789	223.2850	125.4518	85.4170 (83)	
Total gains	575.9863	676.1983	769.9382	900.4599	999.4361	1008.6199	957.2204	861.2930	757.5988	639.0265	569.5410	548.5253 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.2172	61.3548	61.4931	62.1939	62.3360	63.0563	63.0563	63.2024	62.7662	62.3360	62.0525	61.7715	
alpha	5.0811	5.0903	5.0995	5.1463	5.1557	5.2038	5.2038	5.2135	5.1844	5.1557	5.1368	5.1181	
util living area	0.9957	0.9898	0.9730	0.9076	0.7577	0.5539	0.4085	0.4710	0.7440	0.9518	0.9907	0.9967	(86)
MIT	19.7231	19.9270	20.2313	20.6289	20.8888	20.9822	20.9970	20.9939	20.9256	20.5585	20.0725	19.6913	(87)
Th 2	19.9268	19.9289	19.9311	19.9418	19.9440	19.9547	19.9547	19.9569	19.9504	19.9440	19.9397	19.9354	(88)
util rest of house	0.9943	0.9863	0.9637	0.8781	0.6958	0.4693	0.3127	0.3670	0.6579	0.9296	0.9870	0.9955	(89)
MIT 2	18.4548	18.7154	19.0991	19.5837	19.8587	19.9458	19.9539	19.9550	19.9044	19.5161	18.9100	18.4204	(90)
Living area fraction									fLA = Living area / (4) =			0.3956	(91)
MIT	18.9565	19.1948	19.5470	19.9972	20.2662	20.3558	20.3666	20.3660	20.3084	19.9285	19.3699	18.9232	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9565	19.1948	19.5470	19.9972	20.2662	20.3558	20.3666	20.3660	20.3084	19.9285	19.3699	18.9232	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9832	0.9595	0.8798	0.7158	0.5024	0.3507	0.4083	0.6892	0.9292	0.9842	0.9939	(94)
Useful gains	571.5963	664.8139	738.7754	792.2489	715.3984	506.7721	335.7203	351.6615	522.1694	593.8106	560.5400	545.1977	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1349.4224	1313.1609	1195.8429	1005.6700	774.5334	514.4783	336.6712	353.6822	557.4974	843.4549	1114.4794	1343.3934	(97)
Space heating kWh	578.7026	435.6892	340.0583	153.6632	43.9964	0.0000	0.0000	0.0000	0.0000	185.7354	398.8363	593.8576	(98a)
Space heating requirement - total per year (kWh/year)												2730.5390	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	578.7026	435.6892	340.0583	153.6632	43.9964	0.0000	0.0000	0.0000	0.0000	185.7354	398.8363	593.8576	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2730.5390	
Space heating per m2											(98c) / (4) =	35.3376	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	578.7026	435.6892	340.0583	153.6632	43.9964	0.0000	0.0000	0.0000	0.0000	185.7354	398.8363	593.8576	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	578.7026	435.6892	340.0583	153.6632	43.9964	0.0000	0.0000	0.0000	0.0000	185.7354	398.8363	593.8576	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	72.6371	64.1086	67.7800	58.8118	56.4797	50.3158	49.2372	51.5140	52.4355	59.1618	63.7545	71.7411	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.4348	13.9411	15.4348	14.9369	15.4348	14.9369	15.4348	15.4348	14.9369	15.4348	14.9369	15.4348	(231)
Lighting	21.9322	17.5948	15.8422	11.6066	8.9653	7.3247	8.1784	10.6307	13.8082	18.1171	20.4632	22.5417	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	2730.5390	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	717.9771	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	181.7325	(230a)
Total electricity for the above, kWh/year	181.7325	(231)
Electricity for lighting (calculated in Appendix L)	177.0050	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.2536	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2730.5390	0.1561	426.1322	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	717.9771	0.1412	101.3696	(264)
Space and water heating			527.5018	(265)
Pumps, fans and electric keep-hot	181.7325	0.1387	25.2085	(267)
Energy for lighting	177.0050	0.1443	25.5473	(268)
Total CO2, kg/year			578.2576	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.4800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2730.5390	1.5778	4308.1538	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	717.9771	1.5221	1092.8154	(278)
Space and water heating			5400.9692	(279)
Pumps, fans and electric keep-hot	181.7325	1.5128	274.9250	(281)
Energy for lighting	177.0050	1.5338	271.4962	(282)
Total Primary energy kWh/year			5947.3904	(286)
Dwelling Primary energy Rate (DPER)			76.9700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.2700	(1b)	x 2.5500	(2b) =	197.0385	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.0385	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1523	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4023	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3419	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4359	0.4274	0.4188	0.3761	0.3676	0.3248	0.3248	0.3163	0.3419	0.3676	0.3847	0.4018 (22b)
Effective ac	0.5950	0.5913	0.5877	0.5707	0.5676	0.5528	0.5528	0.5500	0.5585	0.5676	0.5740	0.5807 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			17.1800	1.1450	19.6718			(27)
Brickwork	98.4400	17.1800	81.2600	0.1800	14.6268			(29a)
Communal Wall	17.4700	2.1500	15.3200	0.1800	2.7576			(29a)
Lift Shaft	6.7600		6.7600	0.1800	1.2168			(29a)
Terrace Roof	29.3300		29.3300	0.1100	3.2263			(30)
Total net area of external elements Aum(A, m2)			152.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.6493			(33)
Main dwelling								
Party Wall 1			12.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 262.5917 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	54.3100	0.0700	3.8017
E16 Corner (normal)	17.1100	0.0900	1.5399
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0900	-0.7695
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.0200	0.0880
P2 Party wall - Intermediate floor within a dwelling	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E15 Flat roof with parapet	18.6600	0.5600	10.4496
E10 Eaves (insulation at ceiling level)	2.5900	0.0600	0.1554
E1 Steel lintel with perforated steel base plate	11.2200	0.0500	0.5610
E4 Jamb	37.8000	0.0500	1.8900
E5 Ground floor (normal)	42.1100	0.1600	6.7376

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 24.7957 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 68.4450 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.6900	38.4501	38.2149	37.1103	36.9036	35.9416	35.9416	35.7634	36.3121	36.9036	37.3217	37.7588	(38)
Heat transfer coeff	107.1350	106.8951	106.6599	105.5553	105.3486	104.3865	104.3865	104.2084	104.7571	105.3486	105.7667	106.2038	(39)

Average = Sum(39)m / 12 = 105.5543

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3865	1.3834	1.3804	1.3661	1.3634	1.3509	1.3509	1.3486	1.3557	1.3634	1.3688	1.3745	(40)
HLP (average)												1.3660	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4090 (42)

Hot water usage for mixer showers

64.6110	63.6401	62.2252	59.5180	57.5202	55.2922	54.0259	55.4300	56.9693	59.3615	62.1268	64.3635	(42a)

Hot water usage for baths

27.9081	27.4936	26.9099	25.8338	25.0279	24.1344	23.6518	24.2313	24.8624	25.8185	26.9169	27.8137	(42b)

Hot water usage for other uses

39.3008	37.8717	36.4425	35.0134	33.5843	32.1552	32.1552	33.5843	35.0134	36.4425	37.8717	39.3008	(42c)

Average daily hot water use (litres/day) 121.1724 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.8199	129.0053	125.5776	120.3652	116.1324	111.5818	109.8328	113.2457	116.8451	121.6225	126.9153	131.4780	(44)
Energy conte	208.7705	183.7019	193.0082	164.7739	156.3366	137.2029	132.8333	140.2218	144.0817	165.0406	180.8141	205.8628	(45)
Energy content (annual)										Total = Sum(45)m =		2012.6482	
Distribution loss (46)m = 0.15 x (45)m	31.3156	27.5553	28.9512	24.7161	23.4505	20.5804	19.9250	21.0333	21.6123	24.7561	27.1221	30.8794	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

255.3654	225.7876	239.6031	209.8658	202.9315	182.2947	179.4282	186.8167	189.1736	211.6355	225.9059	252.4577	(62)
WWHRS -29.5375	-26.1232	-27.3547	-22.6508	-21.1097	-18.0637	-16.9319	-18.0053	-18.6894	-22.0328	-24.9605	-28.9905	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

225.8279	199.6644	212.2484	187.2150	181.8218	164.2310	162.4963	168.8114	170.4842	189.6027	200.9455	223.4672	(64)
									Total per year (kWh/year) = Sum(64)m =		2286.8158	(64)

12Total per year (kWh/year) 2287 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

106.6921	94.7495	101.4511	90.8608	89.2578	81.6934	81.4430	83.8997	83.9807	92.1519	96.1942	105.7253	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
107.7633 119.3094 107.7633 111.3554 107.7633 111.3554 107.7633 107.7633 111.3554 107.7633 111.3554 107.7633 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
213.6404 215.8573 210.2708 198.3776 183.3647 169.2546 159.8283 157.6113 163.1979 175.0910 190.1040 204.2140 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 (71)
Water heating gains (Table 5)
143.4034 140.9962 136.3591 126.1956 119.9702 113.4631 109.4664 112.7684 116.6398 123.8601 133.6030 142.1039 (72)
Total internal gains
526.9424 538.2983 516.5285 498.0639 473.2335 453.2085 436.1933 437.2784 450.3284 468.8498 497.1977 516.2166 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.8200	11.2829	0.6300	0.7000	0.7700	40.7579	(75)
Southeast	3.8300	36.7938	0.6300	0.7000	0.7700	43.0671	(77)
Northwest	1.5300	11.2829	0.6300	0.7000	0.7700	5.2758	(81)

Solar gains 89.1008 167.0620 269.1960 401.6227 511.9874 535.6167 505.0174 418.5019 314.3961 195.5898 109.5067 74.4499 (83)
Total gains 616.0432 705.3603 785.7244 899.6866 985.2209 988.8252 941.2107 855.7803 764.7246 664.4396 606.7044 590.6664 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.6088	52.7268	52.8431	53.3961	53.5008	53.9939	53.9939	54.0862	53.8029	53.5008	53.2894	53.0700	
alpha	4.5073	4.5151	4.5229	4.5597	4.5667	4.5996	4.5996	4.6057	4.5869	4.5667	4.5526	4.5380	
util living area	0.9946	0.9894	0.9764	0.9302	0.8181	0.6350	0.4786	0.5424	0.7971	0.9573	0.9895	0.9956	(86)
MIT	19.4929	19.6886	20.0005	20.4340	20.7765	20.9482	20.9886	20.9804	20.8542	20.4089	19.8823	19.4644	(87)
Th 2	19.7737	19.7761	19.7784	19.7895	19.7915	19.8012	19.8012	19.8029	19.7974	19.7915	19.7873	19.7830	(88)
util rest of house	0.9927	0.9857	0.9678	0.9044	0.7564	0.5328	0.3531	0.4101	0.7071	0.9359	0.9851	0.9940	(89)
MIT 2	18.0538	18.3041	18.6991	19.2356	19.6146	19.7745	19.7981	19.7970	19.7048	19.2198	18.5602	18.0240	(90)
Living area fraction									fLA = Living area / (4) =			0.3956	(91)
MIT	18.6231	18.8519	19.2140	19.7097	20.0743	20.2389	20.2691	20.2652	20.1595	19.6902	19.0833	18.5939	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6231	18.8519	19.2140	19.7097	20.0743	20.2389	20.2691	20.2652	20.1595	19.6902	19.0833	18.5939	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9901	0.9818	0.9625	0.9024	0.7723	0.5718	0.4030	0.4628	0.7372	0.9337	0.9815	0.9918	(94)
Useful gains	609.9747	692.5050	756.2794	811.8593	760.9147	565.4361	379.3478	396.0554	563.7924	620.3542	595.4635	585.7978	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1534.5096	1491.3849	1356.0717	1141.0226	882.2197	588.6235	383.0045	402.7817	634.7763	957.6432	1267.4295	1528.6816	(97)
Space heating kWh	687.8540	536.8473	446.2455	236.9976	90.2509	0.0000	0.0000	0.0000	0.0000	250.9430	483.8156	701.5055	(98a)
Space heating requirement - total per year (kWh/year)												3434.4593	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	687.8540	536.8473	446.2455	236.9976	90.2509	0.0000	0.0000	0.0000	0.0000	250.9430	483.8156	701.5055	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3434.4593	
Space heating per m2											(98c) / (4) =	44.4475	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	687.8540	536.8473	446.2455	236.9976	90.2509	0.0000	0.0000	0.0000	0.0000	250.9430	483.8156	701.5055	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	745.2372	581.6330	483.4729	256.7688	97.7800	0.0000	0.0000	0.0000	0.0000	271.8776	524.1772	760.0277	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.8279	199.6644	212.2484	187.2150	181.8218	164.2310	162.4963	168.8114	170.4842	189.6027	200.9455	223.4672	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3918	86.1655	85.6851	84.5897	82.5762	79.8000	79.8000	79.8000	79.8000	84.6892	85.9552	86.4446	(217)
Fuel for water heating, kWh/month	261.3998	231.7219	247.7073	221.3213	220.1866	205.8032	203.6294	211.5431	213.6393	223.8805	233.7793	258.5091	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.3911	17.9630	16.1737	11.8495	9.1529	7.4780	8.3496	10.8531	14.0971	18.4962	20.8914	23.0134	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.6248	-30.5152	-46.0065	-54.3385	-60.8824	-57.6609	-56.9513	-52.6240	-45.3985	-36.0267	-23.1777	-17.6671	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.6599	-16.4465	-33.3187	-50.9811	-68.3390	-69.0103	-68.2046	-57.3270	-41.4642	-23.8320	-10.3258	-6.0331	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3720.9743	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2733.1210	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	180.7089	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-954.8158	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5765.9885	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3720.9743	0.2100	781.4046	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2733.1210	0.2100	573.9554	(264)
Space and water heating			1355.3600	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	180.7089	0.1443	26.0819	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-501.8735	0.1336	-67.0427	
PV Unit electricity exported	-452.9423	0.1254	-56.7776	
Total			-123.8203	(269)
Total CO2, kg/year			1269.5509	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3720.9743	1.1300	4204.7010	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2733.1210	1.1300	3088.4268	(278)
Space and water heating			7293.1278	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	180.7089	1.5338	277.1774	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-501.8735	1.4937	-749.6236	
PV Unit electricity exported	-452.9423	0.4601	-208.4009	
Total			-958.0245	(283)
Total Primary energy kWh/year			6742.3815	(286)
Target Primary Energy Rate (TPER)			87.2600	(287)

Full SAP Calculation Printout

Plot Reference	P-04	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-04
Plot Address	Flat 4, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	7.48	**TER**	16.48
Environmental	94 A	**% DER < TER**			54.61
CO_2 Emissions (t/year)	0.48	**DFEE**	52.13	**TFEE**	52.29
Compliance Check	See BREL	**% DFEE < TFEE**			0.30
% DPER < TPER	12.06	**DPER**	76.97	**TPER**	87.52

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.2700	(1b)	x 2.5500	(2b) =	197.0385	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	197.0385	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1523	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9900	(17)
Infiltration rate		0.3018	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2565	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3270	0.3206	0.3142	0.2821	0.2757	0.2437	0.2437	0.2373	0.2565	0.2757	0.2886	0.3014	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5535	0.5514	0.5494	0.5398	0.5380	0.5297	0.5297	0.5281	0.5329	0.5380	0.5416	0.5454	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	98.4400	24.4600	73.9800	0.2100	15.5358	110.0000	8137.8003	(29a)
Communal Wall	17.4700	2.1500	15.3200	0.2200	3.3704	110.0000	1685.1999	(29a)
Lift Shaft	6.7600		6.7600	0.2500	1.6900	110.0000	743.6000	(29a)
Terrace Roof	29.3300		29.3300	0.1300	3.8129	9.0000	263.9700	(30)
Total net area of external elements Aum(A, m2)			152.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.7210			(33)
Main dwelling								
Party Wall 1			12.1500	0.0000	0.0000	110.0000	1336.5000	(32)
Party Floor 1			77.2700			70.0000	5408.9000	(32d)
Party Ceiling 1			47.9400			30.0000	1438.2000	(32b)
Internal Wall 1			141.8100			9.0000	1276.2900	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		20290.4602	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							262.5917	(35)
List of Thermal Bridges								

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	54.3100	0.0380	2.0638	
E16 Corner (normal)	17.1100	0.0540	0.9239	
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520	
P2 Party wall - Intermediate floor within a dwelling	7.6600	0.0000	0.0000	
E18 Party wall between dwellings	2.8500	0.0380	0.1083	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	
E15 Flat roof with parapet	18.6600	0.3000	5.5980	
E10 Eaves (insulation at ceiling level)	2.5900	0.0630	0.1632	
E1 Steel lintel with perforated steel base plate	11.2200	0.0500	0.5610	
E4 Jamb	37.8000	0.0160	0.6048	
E5 Ground floor (normal)	42.1100	0.1120	4.7163	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.4503	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	72.1713	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.9883	35.8533	35.7210	35.0994	34.9831	34.4417	34.4417	34.3414	34.6502	34.9831	35.2183	35.4643	(38)
Heat transfer coeff	108.1596	108.0246	107.8923	107.2707	107.1544	106.6130	106.6130	106.5127	106.8215	107.1544	107.3896	107.6356	(39)
Average = Sum(39)m / 12 =												107.2701	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3998	1.3980	1.3963	1.3883	1.3868	1.3797	1.3797	1.3784	1.3824	1.3868	1.3898	1.3930	(40)
HLP (average)												1.3883	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.4090	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	27.9081	27.4936	26.9099	25.8338	25.0279	24.1344	23.6518	24.2313	24.8624	25.8185	26.9169	27.8137	(42b)
Hot water usage for other uses	39.3008	37.8717	36.4425	35.0134	33.5843	32.1552	32.1552	33.5843	35.0134	36.4425	37.8717	39.3008	(42c)
Average daily hot water use (litres/day)												61.6032	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.2089	65.3653	63.3525	60.8472	58.6122	56.2896	55.8069	57.8156	59.8758	62.2611	64.7885	67.1145	(44)
Energy conte	106.4424	93.0793	97.3704	83.2968	78.9033	69.2146	67.4937	71.5879	73.8329	84.4877	92.3031	105.0851	(45)
Energy content (annual)										Total = Sum(45)m =		1023.0972	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	90.4761	79.1174	82.7649	70.8022	67.0678	58.8324	57.3696	60.8497	62.7580	71.8145	78.4577	89.3223	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	90.4761	79.1174	82.7649	70.8022	67.0678	58.8324	57.3696	60.8497	62.7580	71.8145	78.4577	89.3223	(64)
										Total per year (kWh/year) = Sum(64)m =		869.6326	(64)
12Total per year (kWh/year)												870	(64)
Electric shower(s)	51.7427	46.1032	50.3429	48.0416	48.9431	46.6869	48.2432	48.9431	48.0416	50.3429	49.3962	51.7427	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		588.5700	(64a)
Heat gains from water heating, kWh/month	35.5547	31.3051	33.2769	29.7110	29.0027	26.3798	26.4032	27.4482	27.6999	30.5393	31.9635	35.2663	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.7571	119.3025	107.7571	111.3490	107.7571	111.3490	107.7571	107.7571	111.3490	107.7571	111.3490	107.7571	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.6404	215.8573	210.2708	198.3776	183.3647	169.2546	159.8283	157.6113	163.1979	175.0910	190.1040	204.2140	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	(71)
Water heating gains (Table 5)	47.7886	46.5850	44.7271	41.2652	38.9822	36.6387	35.4882	36.8927	38.4721	41.0475	44.3937	47.4009	(72)
Total internal gains	428.3213	440.8801	421.8902	410.1271	389.2392	376.3776	362.2088	361.3964	372.1542	383.0309	404.9820	418.5073	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Northeast	16.8300	11.2829	0.3100	0.0000	0.7700	45.3272	(75)
Northwest	2.1800	11.2829	0.3100	0.0000	0.7700	5.8713	(81)

Solar gains	102.1522	191.0090	306.5181	455.5045	579.3109	605.5200	571.1355	474.1229	357.3789	223.2850	125.4518	85.4170	(83)

Total gains	530.4735	631.8892	728.4083	865.6316	968.5502	981.8975	933.3443	835.5194	729.5331	606.3159	530.4337	503.9243	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.1104	52.1755	52.2395	52.5422	52.5992	52.8664	52.8664	52.9161	52.7631	52.5992	52.4840	52.3641	
alpha	4.4740	4.4784	4.4826	4.5028	4.5066	4.5244	4.5244	4.5277	4.5175	4.5066	4.4989	4.4909	
util living area													
	0.9971	0.9931	0.9824	0.9398	0.8299	0.6477	0.4912	0.5636	0.8229	0.9696	0.9938	0.9977	(86)
MIT	19.3672	19.5786	19.9143	20.3795	20.7530	20.9406	20.9864	20.9755	20.8247	20.3255	19.7637	19.3293	(87)
Th 2	19.7635	19.7649	19.7662	19.7723	19.7735	19.7789	19.7789	19.7799	19.7768	19.7735	19.7712	19.7687	(88)
util rest of house													
	0.9960	0.9906	0.9756	0.9165	0.7694	0.5433	0.3607	0.4254	0.7360	0.9533	0.9911	0.9968	(89)
MIT 2	18.3010	18.5121	18.8444	19.2947	19.6199	19.7550	19.7761	19.7740	19.6878	19.2547	18.7020	18.2671	(90)
Living area fraction										fLA = Living area / (4) =		0.3956	(91)
MIT	18.7228	18.9340	19.2677	19.7239	20.0682	20.2240	20.2549	20.2494	20.1376	19.6783	19.1220	18.6873	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7228	18.9340	19.2677	19.7239	20.0682	20.2240	20.2549	20.2494	20.1376	19.6783	19.1220	18.6873	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9883	0.9721	0.9154	0.7855	0.5833	0.4128	0.4806	0.7650	0.9517	0.9891	0.9958	(94)
Useful gains	527.6584	624.5102	708.0596	792.3622	760.8047	572.7752	385.2624	401.5251	558.0848	577.0182	524.6774	501.7835	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1559.9638	1516.0188	1377.5361	1161.0835	896.6874	599.5967	389.6590	410.0071	644.9456	972.7836	1291.0435	1559.3511	(97)
Space heating kWh													
	768.0352	599.0938	498.0905	265.4793	101.0968	0.0000	0.0000	0.0000	0.0000	294.4495	551.7836	786.8303	(98a)
Space heating requirement - total per year (kWh/year)												3864.8589	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	768.0352	599.0938	498.0905	265.4793	101.0968	0.0000	0.0000	0.0000	0.0000	294.4495	551.7836	786.8303	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3864.8589	
Space heating per m2											(98c) / (4) =	50.0176	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1002.1620	788.9360	809.4967	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8570	0.9145	0.8744	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	858.8975	721.4932	707.7938	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1106.4800	1051.8299	939.5890	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	178.2594	245.7705	172.4557	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	44.5649	61.4426	43.1139	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												149.1214	(107)
Energy for space heating												50.0176	(99)
Energy for space cooling												1.9299	(108)
Total												51.9475	(109)
Fabric Energy Efficiency (DFEE)												51.9	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.2700	(1b)	x 2.5500	(2b) =	197.0385	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		197.0385	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)

Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1523 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4023 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3419 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4359	0.4274	0.4188	0.3761	0.3676	0.3248	0.3248	0.3163	0.3419	0.3676	0.3847	0.4018	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)
Effective ac	0.5950 0.5913 0.5877 0.5707 0.5676 0.5528 0.5528 0.5500 0.5585 0.5676 0.5740 0.5807	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			17.1800	1.1450	19.6718			(27)
Brickwork	98.4400	17.1800	81.2600	0.1800	14.6268			(29a)
Communal Wall	17.4700	2.1500	15.3200	0.1800	2.7576			(29a)
Lift Shaft	6.7600		6.7600	0.1800	1.2168			(29a)
Terrace Roof	29.3300		29.3300	0.1100	3.2263			(30)
Total net area of external elements Aum(A, m2)			152.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.6493			(33)
Main dwelling								
Party Wall 1			12.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		262.5917 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	54.3100	0.0700	3.8017
E16 Corner (normal)	17.1100	0.0900	1.5399
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0900	-0.7695
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.0200	0.0880
P2 Party wall - Intermediate floor within a dwelling	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E15 Flat roof with parapet	18.6600	0.5600	10.4496
E10 Eaves (insulation at ceiling level)	2.5900	0.0600	0.1554
E1 Steel lintel with perforated steel base plate	11.2200	0.0500	0.5610
E4 Jamb	37.8000	0.0500	1.8900
E5 Ground floor (normal)	42.1100	0.1600	6.7376

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		24.7957 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	68.4450 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.6900	38.4501	38.2149	37.1103	36.9036	35.9416	35.9416	35.7634	36.3121	36.9036	37.3217	37.7588	(38)
Heat transfer coeff	107.1350	106.8951	106.6599	105.5553	105.3486	104.3865	104.3865	104.2084	104.7571	105.3486	105.7667	106.2038	(39)
Average = Sum(39)m / 12 =												105.5543	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3865	1.3834	1.3804	1.3661	1.3634	1.3509	1.3509	1.3486	1.3557	1.3634	1.3688	1.3745	(40)
HLP (average)												1.3660	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4090 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.9081	27.4936	26.9099	25.8338	25.0279	24.1344	23.6518	24.2313	24.8624	25.8185	26.9169	27.8137	(42b)

Hot water usage for other uses

39.3008	37.8717	36.4425	35.0134	33.5843	32.1552	32.1552	33.5843	35.0134	36.4425	37.8717	39.3008	(42c)

Average daily hot water use (litres/day)		61.6032 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.2089	65.3653	63.3525	60.8472	58.6122	56.2896	55.8069	57.8156	59.8758	62.2611	64.7885	67.1145	(44)
Energy conte	106.4424	93.0793	97.3704	83.2968	78.9033	69.2146	67.4937	71.5879	73.8329	84.4877	92.3031	105.0851	(45)
Energy content (annual)										Total = Sum(45)m =		1023.0972	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	90.4761	79.1174	82.7649	70.8022	67.0678	58.8324	57.3696	60.8497	62.7580	71.8145	78.4577	89.3223	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	90.4761	79.1174	82.7649	70.8022	67.0678	58.8324	57.3696	60.8497	62.7580	71.8145	78.4577	89.3223	(64)

Total per year (kWh/year) = Sum(64)m =		869.6326 (64)

12Total per year (kWh/year) 870 (64)

Electric shower(s)

	51.7427	46.1032	50.3429	48.0416	48.9431	46.6869	48.2432	48.9431	48.0416	50.3429	49.3962	51.7427 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 588.5700 (64a)

Heat gains from water heating, kWh/month

	35.5547	31.3051	33.2769	29.7110	29.0027	26.3798	26.4032	27.4482	27.6999	30.5393	31.9635	35.2663 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	107.7633	119.3094	107.7633	111.3554	107.7633	111.3554	107.7633	107.7633	111.3554	107.7633	111.3554	107.7633	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	213.6404	215.8573	210.2708	198.3776	183.3647	169.2546	159.8283	157.6113	163.1979	175.0910	190.1040	204.2140	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	(71)

Water heating gains (Table 5)

	47.7886	46.5850	44.7271	41.2652	38.9822	36.6387	35.4882	36.8927	38.4721	41.0475	44.3937	47.4009	(72)

Total internal gains

	428.3276	440.8871	421.8965	410.1336	389.2455	376.3841	362.2151	361.4027	372.1607	383.0372	404.9884	418.5136	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.8200	11.2829	0.6300	0.7000	0.7700	40.7579	(75)
Southeast	3.8300	36.7938	0.6300	0.7000	0.7700	43.0671	(77)
Northwest	1.5300	11.2829	0.6300	0.7000	0.7700	5.2758	(81)

Solar gains	89.1008	167.0620	269.1960	401.6227	511.9874	535.6167	505.0174	418.5019	314.3961	195.5898	109.5067	74.4499	(83)
Total gains	517.4284	607.9491	691.0924	811.7563	901.2329	912.0008	867.2325	779.9046	686.5568	578.6270	514.4951	492.9634	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.6088	52.7268	52.8431	53.3961	53.5008	53.9939	53.9939	54.0862	53.8029	53.5008	53.2894	53.0700	
alpha	4.5073	4.5151	4.5229	4.5597	4.5667	4.5996	4.5996	4.6057	4.5869	4.5667	4.5526	4.5380	
util living area	0.9973	0.9941	0.9854	0.9498	0.8528	0.6758	0.5158	0.5877	0.8415	0.9737	0.9945	0.9979	(86)
MIT	19.3690	19.5687	19.8899	20.3493	20.7285	20.9333	20.9846	20.9729	20.8131	20.3155	19.7684	19.3411	(87)
Th 2	19.7737	19.7761	19.7784	19.7895	19.7915	19.8012	19.8012	19.8029	19.7974	19.7915	19.7873	19.7830	(88)
util rest of house	0.9964	0.9919	0.9797	0.9297	0.7968	0.5719	0.3824	0.4480	0.7592	0.9594	0.9921	0.9971	(89)
MIT 2	18.3104	18.5108	18.8304	19.2820	19.6188	19.7736	19.7978	19.7962	19.7001	19.2601	18.7190	18.2895	(90)
Living area fraction									fLA = Living area / (4) =			0.3956	(91)
MIT	18.7292	18.9293	19.2496	19.7042	20.0578	20.2324	20.2674	20.2618	20.1404	19.6776	19.1342	18.7055	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7292	18.9293	19.2496	19.7042	20.0578	20.2324	20.2674	20.2618	20.1404	19.6776	19.1342	18.7055	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9898	0.9764	0.9280	0.8107	0.6114	0.4356	0.5038	0.7860	0.9576	0.9903	0.9961	(94)
Useful gains	514.9423	601.7747	674.7908	753.2752	730.6073	557.6166	377.7981	392.9481	539.6227	554.0916	509.5018	491.0560	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1545.8731	1499.6650	1359.8685	1140.4428	880.4806	587.9463	382.8223	402.4287	632.7779	956.3166	1272.8129	1540.5393	(97)
Space heating kWh	767.0125	603.3823	509.6978	278.7606	111.5058	0.0000	0.0000	0.0000	0.0000	299.2554	549.5840	780.8156	(98a)

Space heating requirement - total per year (kWh/year) 3900.0142

Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh	767.0125	603.3823	509.6978	278.7606	111.5058	0.0000	0.0000	0.0000	0.0000	299.2554	549.5840	780.8156	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 3900.0142

Space heating per m2 (98c) / (4) = 50.4726 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	981.2333	772.4603	791.9836	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8388	0.9022	0.8598	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	823.0304	696.8884	680.9472	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1024.7755	974.5497	874.5782	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	145.2565	206.5800	144.0615	0.0000	0.0000	0.0000	0.0000	(104)

Cooled fraction fC = cooled area / (4) = 1.0000 (105)

Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	36.3141	51.6450	36.0154	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement											123.9745 (107)
Energy for space heating											50.4726 (99)
Energy for space cooling											1.6044 (108)
Total											52.0770 (109)
Fabric Energy Efficiency (TFEE)											52.1 (109)

Full SAP Calculation Printout

Plot Reference	P-04	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-04
Plot Address	Flat 4, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	7.48	**TER**	16.48
Environmental	94 A	**% DER < TER**			54.61
CO_2 Emissions (t/year)	0.48	**DFEE**	52.13	**TFEE**	52.29
Compliance Check	See BREL	**% DFEE < TFEE**			0.30
% DPER < TPER	12.06	**DPER**	76.97	**TPER**	87.52

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.2700	(1b)	x 2.5500	(2b) =	197.0385	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	197.0385	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9900	(17)
Infiltration rate		0.1495	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1271	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1620	0.1588	0.1557	0.1398	0.1366	0.1207	0.1207	0.1175	0.1271	0.1366	0.1430	0.1493	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		71.2000 (23c)

Effective ac	0.3060	0.3028	0.2997	0.2838	0.2806	0.2647	0.2647	0.2615	0.2711	0.2806	0.2870	0.2933	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	98.4400	24.4600	73.9800	0.2100	15.5358	110.0000	8137.8003	(29a)
Communal Wall	17.4700	2.1500	15.3200	0.2200	3.3704	110.0000	1685.1999	(29a)
Lift Shaft	6.7600		6.7600	0.2500	1.6900	110.0000	743.6000	(29a)
Terrace Roof	29.3300		29.3300	0.1300	3.8129	9.0000	263.9700	(30)
Total net area of external elements Aum(A, m2)			152.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.7210			(33)
Main dwelling								
Party Wall 1			12.1500	0.0000	0.0000	110.0000	1336.5000	(32)
Party Floor 1			77.2700			70.0000	5408.9000	(32d)
Party Ceiling 1			47.9400			30.0000	1438.2000	(32b)
Internal Wall 1			141.8100			9.0000	1276.2900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20290.4602	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		262.5917	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	54.3100	0.0380	2.0638
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P2 Party wall - Intermediate floor within a dwelling	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E15 Flat roof with parapet	18.6600	0.3000	5.5980
E10 Eaves (insulation at ceiling level)	2.5900	0.0630	0.1632
E1 Steel lintel with perforated steel base plate	11.2200	0.0500	0.5610
E4 Jamb	37.8000	0.0160	0.6048
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.4503	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	72.1713	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8983	19.6917	19.4851	18.4523	18.2457	17.2129	17.2129	17.0063	17.6260	18.2457	18.6589	19.0720	(38)
Heat transfer coeff	92.0696	91.8630	91.6565	90.6236	90.4170	89.3842	89.3842	89.1776	89.7973	90.4170	90.8302	91.2433	(39)
Average = Sum(39)m / 12 =												90.5720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1915	1.1889	1.1862	1.1728	1.1701	1.1568	1.1568	1.1541	1.1621	1.1701	1.1755	1.1808	(40)
HLP (average)												1.1721	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4090 (42)
Hot water usage for mixer showers	64.6110	63.6401	62.2252	59.5180	57.5202	55.2922	54.0259	55.4300	56.9693	59.3615	62.1268	64.3635 (42a)
Hot water usage for baths	27.9081	27.4936	26.9099	25.8338	25.0279	24.1344	23.6518	24.2313	24.8624	25.8185	26.9169	27.8137 (42b)
Hot water usage for other uses	39.3008	37.8717	36.4425	35.0134	33.5843	32.1552	32.1552	33.5843	35.0134	36.4425	37.8717	39.3008 (42c)
Average daily hot water use (litres/day)												121.1724 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.8199	129.0053	125.5776	120.3652	116.1324	111.5818	109.8328	113.2457	116.8451	121.6225	126.9153	131.4780	(44)
Energy conte	208.7705	183.7019	193.0082	164.7739	156.3366	137.2029	132.8333	140.2218	144.0817	165.0406	180.8141	205.8628	(45)
Energy content (annual)										Total = Sum(45)m =		2012.6482	
Distribution loss (46)m = 0.15 x (45)m	31.3156	27.5553	28.9512	24.7161	23.4505	20.5804	19.9250	21.0333	21.6123	24.7561	27.1221	30.8794	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)
									Total per year (kWh/year) = Sum(64)m =			2329.9792	(64)
12Total per year (kWh/year)												2330	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	69.4162	61.0809	64.1752	54.7873	51.9819	45.6199	44.1671	46.6238	47.9072	54.8760	60.1207	68.4494	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.7571	119.3025	107.7571	111.3490	107.7571	111.3490	107.7571	107.7571	111.3490	107.7571	111.3490	107.7571	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.6404	215.8573	210.2708	198.3776	183.3647	169.2546	159.8283	157.6113	163.1979	175.0910	190.1040	204.2140	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	35.0451	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	(71)
Water heating gains (Table 5)	93.3013	90.8942	86.2570	76.0935	69.8682	63.3610	59.3643	62.6663	66.5377	73.7581	83.5010	92.0019	(72)
Total internal gains	473.8341	485.1893	463.4201	444.9554	420.1252	403.0999	386.0849	387.1700	400.2199	415.7415	444.0892	463.1082	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Southeast			5.4500		36.7938		0.3300		0.0000		0.7700		50.9538 (77)
Northeast			16.8300		11.2829		0.3100		0.0000		0.7700		45.3272 (75)
Northwest			2.1800		11.2829		0.3100		0.0000		0.7700		5.8713 (81)
Solar gains	102.1522	191.0090	306.5181	455.5045	579.3109	605.5200	571.1355	474.1229	357.3789	223.2850	125.4518	85.4170 (83)	
Total gains	575.9863	676.1983	769.9382	900.4599	999.4361	1008.6199	957.2204	861.2930	757.5988	639.0265	569.5410	548.5253 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.2172	61.3548	61.4931	62.1939	62.3360	63.0563	63.0563	63.2024	62.7662	62.3360	62.0525	61.7715	
alpha	5.0811	5.0903	5.0995	5.1463	5.1557	5.2038	5.2038	5.2135	5.1844	5.1557	5.1368	5.1181	
util living area	0.9957	0.9898	0.9730	0.9076	0.7577	0.5539	0.4085	0.4710	0.7440	0.9518	0.9907	0.9967	(86)
MIT	19.7231	19.9270	20.2313	20.6289	20.8888	20.9822	20.9970	20.9939	20.9256	20.5585	20.0725	19.6913	(87)
Th 2	19.9268	19.9289	19.9311	19.9418	19.9440	19.9547	19.9547	19.9569	19.9504	19.9440	19.9397	19.9354	(88)
util rest of house	0.9943	0.9863	0.9637	0.8781	0.6958	0.4693	0.3127	0.3670	0.6579	0.9296	0.9870	0.9955	(89)
MIT 2	18.4548	18.7154	19.0991	19.5837	19.8587	19.9458	19.9539	19.9550	19.9044	19.5161	18.9100	18.4204	(90)
Living area fraction									fLA = Living area / (4) =			0.3956	(91)
MIT	18.9565	19.1948	19.5470	19.9972	20.2662	20.3558	20.3666	20.3660	20.3084	19.9285	19.3699	18.9232	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9565	19.1948	19.5470	19.9972	20.2662	20.3558	20.3666	20.3660	20.3084	19.9285	19.3699	18.9232	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9832	0.9595	0.8798	0.7158	0.5024	0.3507	0.4083	0.6892	0.9292	0.9842	0.9939	(94)
Useful gains	571.5963	664.8139	738.7754	792.2489	715.3984	506.7721	335.7203	351.6615	522.1694	593.8106	560.5400	545.1977	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1349.4224	1313.1609	1195.8429	1005.6700	774.5334	514.4783	336.6712	353.6822	557.4974	843.4549	1114.4794	1343.3934	(97)
Space heating kWh	578.7026	435.6892	340.0583	153.6632	43.9964	0.0000	0.0000	0.0000	0.0000	185.7354	398.8363	593.8576	(98a)
Space heating requirement - total per year (kWh/year)												2730.5390	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	578.7026	435.6892	340.0583	153.6632	43.9964	0.0000	0.0000	0.0000	0.0000	185.7354	398.8363	593.8576	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2730.5390	
Space heating per m2											(98c) / (4) =	35.3376	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	578.7026	435.6892	340.0583	153.6632	43.9964	0.0000	0.0000	0.0000	0.0000	185.7354	398.8363	593.8576	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	578.7026	435.6892	340.0583	153.6632	43.9964	0.0000	0.0000	0.0000	0.0000	185.7354	398.8363	593.8576	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	72.6371	64.1086	67.7800	58.8118	56.4797	50.3158	49.2372	51.5140	52.4355	59.1618	63.7545	71.7411	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.4348	13.9411	15.4348	14.9369	15.4348	14.9369	15.4348	15.4348	14.9369	15.4348	14.9369	15.4348	(231)
Lighting	21.9322	17.5948	15.8422	11.6066	8.9653	7.3247	8.1784	10.6307	13.8082	18.1171	20.4632	22.5417	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	2730.5390	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	717.9771	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	181.7325	(230a)
Total electricity for the above, kWh/year	181.7325	(231)
Electricity for lighting (calculated in Appendix L)	177.0050	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.2536	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2730.5390	0.1561	426.1322	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	717.9771	0.1412	101.3696	(264)
Space and water heating			527.5018	(265)
Pumps, fans and electric keep-hot	181.7325	0.1387	25.2085	(267)
Energy for lighting	177.0050	0.1443	25.5473	(268)
Total CO2, kg/year			578.2576	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.4800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2730.5390	1.5778	4308.1538	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	717.9771	1.5221	1092.8154	(278)
Space and water heating			5400.9692	(279)
Pumps, fans and electric keep-hot	181.7325	1.5128	274.9250	(281)
Energy for lighting	177.0050	1.5338	271.4962	(282)
Total Primary energy kWh/year			5947.3904	(286)
Dwelling Primary energy Rate (DPER)			76.9700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.2700	(1b)	x 2.5500	(2b) =	197.0385	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.0385	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1523	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4023	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3419	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4359	0.4274	0.4188	0.3761	0.3676	0.3248	0.3248	0.3163	0.3419	0.3676	0.3847	0.4018 (22b)
Effective ac	0.5950	0.5913	0.5877	0.5707	0.5676	0.5528	0.5528	0.5500	0.5585	0.5676	0.5740	0.5807 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			17.1800	1.1450	19.6718			(27)
Brickwork	98.4400	17.1800	81.2600	0.1800	14.6268			(29a)
Communal Wall	17.4700	2.1500	15.3200	0.1800	2.7576			(29a)
Lift Shaft	6.7600		6.7600	0.1800	1.2168			(29a)
Terrace Roof	29.3300		29.3300	0.1100	3.2263			(30)
Total net area of external elements Aum(A, m2)			152.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.6493			(33)
Main dwelling								
Party Wall 1			12.1500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 262.5917 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	54.3100	0.0700	3.8017
E16 Corner (normal)	17.1100	0.0900	1.5399
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0900	-0.7695
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.0200	0.0880
P2 Party wall - Intermediate floor within a dwelling	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E15 Flat roof with parapet	18.6600	0.5600	10.4496
E10 Eaves (insulation at ceiling level)	2.5900	0.0600	0.1554
E1 Steel lintel with perforated steel base plate	11.2200	0.0500	0.5610
E4 Jamb	37.8000	0.0500	1.8900
E5 Ground floor (normal)	42.1100	0.1600	6.7376

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 24.7957 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 68.4450 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.6900	38.4501	38.2149	37.1103	36.9036	35.9416	35.9416	35.7634	36.3121	36.9036	37.3217	37.7588	(38)
Heat transfer coeff	107.1350	106.8951	106.6599	105.5553	105.3486	104.3865	104.3865	104.2084	104.7571	105.3486	105.7667	106.2038	(39)

Average = Sum(39)m / 12 = 105.5543

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3865	1.3834	1.3804	1.3661	1.3634	1.3509	1.3509	1.3486	1.3557	1.3634	1.3688	1.3745	(40)
HLP (average)												1.3660	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4090 (42)

Hot water usage for mixer showers

64.6110	63.6401	62.2252	59.5180	57.5202	55.2922	54.0259	55.4300	56.9693	59.3615	62.1268	64.3635	(42a)

Hot water usage for baths

27.9081	27.4936	26.9099	25.8338	25.0279	24.1344	23.6518	24.2313	24.8624	25.8185	26.9169	27.8137	(42b)

Hot water usage for other uses

39.3008	37.8717	36.4425	35.0134	33.5843	32.1552	32.1552	33.5843	35.0134	36.4425	37.8717	39.3008	(42c)

Average daily hot water use (litres/day) 121.1724 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.8199	129.0053	125.5776	120.3652	116.1324	111.5818	109.8328	113.2457	116.8451	121.6225	126.9153	131.4780	(44)
Energy conte	208.7705	183.7019	193.0082	164.7739	156.3366	137.2029	132.8333	140.2218	144.0817	165.0406	180.8141	205.8628	(45)
Energy content (annual)										Total = Sum(45)m =		2012.6482	
Distribution loss (46)m = 0.15 x (45)m	31.3156	27.5553	28.9512	24.7161	23.4505	20.5804	19.9250	21.0333	21.6123	24.7561	27.1221	30.8794	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

255.3654	225.7876	239.6031	209.8658	202.9315	182.2947	179.4282	186.8167	189.1736	211.6355	225.9059	252.4577	(62)
WWHRS -29.5375	-26.1232	-27.3547	-22.6508	-21.1097	-18.0637	-16.9319	-18.0053	-18.6894	-22.0328	-24.9605	-28.9905	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

225.8279	199.6644	212.2484	187.2150	181.8218	164.2310	162.4963	168.8114	170.4842	189.6027	200.9455	223.4672	(64)
									Total per year (kWh/year) = Sum(64)m =		2286.8158	(64)

12Total per year (kWh/year) 2287 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

106.6921	94.7495	101.4511	90.8608	89.2578	81.6934	81.4430	83.8997	83.9807	92.1519	96.1942	105.7253	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	120.4510	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
107.7633 119.3094 107.7633 111.3554 107.7633 111.3554 107.7633 107.7633 111.3554 107.7633 111.3554 107.7633 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
213.6404 215.8573 210.2708 198.3776 183.3647 169.2546 159.8283 157.6113 163.1979 175.0910 190.1040 204.2140 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 35.0451 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 -96.3608 (71)
Water heating gains (Table 5)
143.4034 140.9962 136.3591 126.1956 119.9702 113.4631 109.4664 112.7684 116.6398 123.8601 133.6030 142.1039 (72)
Total internal gains
526.9424 538.2983 516.5285 498.0639 473.2335 453.2085 436.1933 437.2784 450.3284 468.8498 497.1977 516.2166 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.8200	11.2829	0.6300	0.7000	0.7700	40.7579	(75)
Southeast	3.8300	36.7938	0.6300	0.7000	0.7700	43.0671	(77)
Northwest	1.5300	11.2829	0.6300	0.7000	0.7700	5.2758	(81)

Solar gains 89.1008 167.0620 269.1960 401.6227 511.9874 535.6167 505.0174 418.5019 314.3961 195.5898 109.5067 74.4499 (83)
Total gains 616.0432 705.3603 785.7244 899.6866 985.2209 988.8252 941.2107 855.7803 764.7246 664.4396 606.7044 590.6664 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.6088	52.7268	52.8431	53.3961	53.5008	53.9939	53.9939	54.0862	53.8029	53.5008	53.2894	53.0700	
alpha	4.5073	4.5151	4.5229	4.5597	4.5667	4.5996	4.5996	4.6057	4.5869	4.5667	4.5526	4.5380	
util living area	0.9946	0.9894	0.9764	0.9302	0.8181	0.6350	0.4786	0.5424	0.7971	0.9573	0.9895	0.9956	(86)
MIT	19.4929	19.6886	20.0005	20.4340	20.7765	20.9482	20.9886	20.9804	20.8542	20.4089	19.8823	19.4644	(87)
Th 2	19.7737	19.7761	19.7784	19.7895	19.7915	19.8012	19.8012	19.8029	19.7974	19.7915	19.7873	19.7830	(88)
util rest of house	0.9927	0.9857	0.9678	0.9044	0.7564	0.5328	0.3531	0.4101	0.7071	0.9359	0.9851	0.9940	(89)
MIT 2	18.0538	18.3041	18.6991	19.2356	19.6146	19.7745	19.7981	19.7970	19.7048	19.2198	18.5602	18.0240	(90)
Living area fraction									fLA = Living area / (4) =			0.3956	(91)
MIT	18.6231	18.8519	19.2140	19.7097	20.0743	20.2389	20.2691	20.2652	20.1595	19.6902	19.0833	18.5939	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6231	18.8519	19.2140	19.7097	20.0743	20.2389	20.2691	20.2652	20.1595	19.6902	19.0833	18.5939	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9901	0.9818	0.9625	0.9024	0.7723	0.5718	0.4030	0.4628	0.7372	0.9337	0.9815	0.9918	(94)
Useful gains	609.9747	692.5050	756.2794	811.8593	760.9147	565.4361	379.3478	396.0554	563.7924	620.3542	595.4635	585.7978	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1534.5096	1491.3849	1356.0717	1141.0226	882.2197	588.6235	383.0045	402.7817	634.7763	957.6432	1267.4295	1528.6816	(97)
Space heating kWh	687.8540	536.8473	446.2455	236.9976	90.2509	0.0000	0.0000	0.0000	0.0000	250.9430	483.8156	701.5055	(98a)
Space heating requirement - total per year (kWh/year)												3434.4593	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	687.8540	536.8473	446.2455	236.9976	90.2509	0.0000	0.0000	0.0000	0.0000	250.9430	483.8156	701.5055	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3434.4593	
Space heating per m2											(98c) / (4) =	44.4475	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	687.8540	536.8473	446.2455	236.9976	90.2509	0.0000	0.0000	0.0000	0.0000	250.9430	483.8156	701.5055	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	745.2372	581.6330	483.4729	256.7688	97.7800	0.0000	0.0000	0.0000	0.0000	271.8776	524.1772	760.0277	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.8279	199.6644	212.2484	187.2150	181.8218	164.2310	162.4963	168.8114	170.4842	189.6027	200.9455	223.4672	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3918	86.1655	85.6851	84.5897	82.5762	79.8000	79.8000	79.8000	79.8000	84.6892	85.9552	86.4446	(217)
Fuel for water heating, kWh/month	261.3998	231.7219	247.7073	221.3213	220.1866	205.8032	203.6294	211.5431	213.6393	223.8805	233.7793	258.5091	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.3911	17.9630	16.1737	11.8495	9.1529	7.4780	8.3496	10.8531	14.0971	18.4962	20.8914	23.0134	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.6248	-30.5152	-46.0065	-54.3385	-60.8824	-57.6609	-56.9513	-52.6240	-45.3985	-36.0267	-23.1777	-17.6671	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.6599	-16.4465	-33.3187	-50.9811	-68.3390	-69.0103	-68.2046	-57.3270	-41.4642	-23.8320	-10.3258	-6.0331	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3720.9743	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2733.1210	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	180.7089	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-954.8158	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5765.9885	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3720.9743	0.2100	781.4046	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2733.1210	0.2100	573.9554	(264)
Space and water heating			1355.3600	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	180.7089	0.1443	26.0819	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-501.8735	0.1336	-67.0427	
PV Unit electricity exported	-452.9423	0.1254	-56.7776	
Total			-123.8203	(269)
Total CO2, kg/year			1269.5509	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3720.9743	1.1300	4204.7010	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2733.1210	1.1300	3088.4268	(278)
Space and water heating			7293.1278	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	180.7089	1.5338	277.1774	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-501.8735	1.4937	-749.6236	
PV Unit electricity exported	-452.9423	0.4601	-208.4009	
Total			-958.0245	(283)
Total Primary energy kWh/year			6742.3815	(286)
Target Primary Energy Rate (TPER)			87.2600	(287)

Full SAP Calculation Printout

Plot Reference	P-04	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-04
Plot Address	Flat 4, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	7.48	**TER**	16.48
Environmental	94 A	**% DER < TER**			54.61
CO_2 Emissions (t/year)	0.48	**DFEE**	52.13	**TFEE**	52.29
Compliance Check	See BREL	**% DFEE < TFEE**			0.30
% DPER < TPER	12.06	**DPER**	76.97	**TPER**	87.52

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.2700	(1b)	x 2.5500	(2b) =	197.0385	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2700					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.0385	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9900 (17)
Infiltration rate		0.1495 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1271 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1620	0.1588	0.1557	0.1398	0.1366	0.1207	0.1207	0.1175	0.1271	0.1366	0.1430	0.1493	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000	(23c)
Effective ac	0.3060	0.3028	0.2997	0.2838	0.2806	0.2647	0.2647	0.2615	0.2711	0.2806	0.2870	0.2933	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	98.4400	24.4600	73.9800	0.2100	15.5358	110.0000	8137.8003	(29a)
Communal Wall	17.4700	2.1500	15.3200	0.2200	3.3704	110.0000	1685.1999	(29a)
Lift Shaft	6.7600		6.7600	0.2500	1.6900	110.0000	743.6000	(29a)
Terrace Roof	29.3300		29.3300	0.1300	3.8129	9.0000	263.9700	(30)
Total net area of external elements Aum(A, m2)			152.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.7210			(33)
Main dwelling								
Party Wall 1			12.1500	0.0000	0.0000	110.0000	1336.5000	(32)
Party Floor 1			77.2700			70.0000	5408.9000	(32d)
Party Ceiling 1			47.9400			30.0000	1438.2000	(32b)
Internal Wall 1			141.8100			9.0000	1276.2900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20290.4602	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		262.5917	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	54.3100	0.0380	2.0638
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P2 Party wall - Intermediate floor within a dwelling	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E15 Flat roof with parapet	18.6600	0.3000	5.5980
E10 Eaves (insulation at ceiling level)	2.5900	0.0630	0.1632
E1 Steel lintel with perforated steel base plate	11.2200	0.0500	0.5610
E4 Jamb	37.8000	0.0160	0.6048
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.4503	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	72.1713	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8983	19.6917	19.4851	18.4523	18.2457	17.2129	17.2129	17.0063	17.6260	18.2457	18.6589	19.0720	(38)
Heat transfer coeff	92.0696	91.8630	91.6565	90.6236	90.4170	89.3842	89.3842	89.1776	89.7973	90.4170	90.8302	91.2433	(39)
Average = Sum(39)m / 12 =												90.5720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1915	1.1889	1.1862	1.1728	1.1701	1.1568	1.1568	1.1541	1.1621	1.1701	1.1755	1.1808	(40)
HLP (average)												1.1721	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4090	(42)
Hot water usage for mixer showers	64.6110	63.6401	62.2252	59.5180	57.5202	55.2922	54.0259	55.4300	56.9693	59.3615	62.1268	64.3635	(42a)
Hot water usage for baths	27.9081	27.4936	26.9099	25.8338	25.0279	24.1344	23.6518	24.2313	24.8624	25.8185	26.9169	27.8137	(42b)
Hot water usage for other uses	39.3008	37.8717	36.4425	35.0134	33.5843	32.1552	32.1552	33.5843	35.0134	36.4425	37.8717	39.3008	(42c)
Average daily hot water use (litres/day)												121.1724	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.8199	129.0053	125.5776	120.3652	116.1324	111.5818	109.8328	113.2457	116.8451	121.6225	126.9153	131.4780	(44)
Energy conte	208.7705	183.7019	193.0082	164.7739	156.3366	137.2029	132.8333	140.2218	144.0817	165.0406	180.8141	205.8628	(45)
Energy content (annual)										Total = Sum(45)m =		2012.6482	
Distribution loss (46)m = 0.15 x (45)m	31.3156	27.5553	28.9512	24.7161	23.4505	20.5804	19.9250	21.0333	21.6123	24.7561	27.1221	30.8794	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)
										Total per year (kWh/year) = Sum(64)m =		2329.9792	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.4162	61.0809	64.1752	54.7873	51.9819	45.6199	44.1671	46.6238	47.9072	54.8760	60.1207	68.4494	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.0569	22.2553	18.0992	13.7023	10.2426	8.6473	9.3437	12.1452	16.3013	20.6983	24.1579	25.7533	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	318.8663	322.1751	313.8370	296.0860	273.6786	252.6189	238.5496	235.2408	243.5790	261.3299	283.7373	304.7971	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	(71)
Water heating gains (Table 5)	93.3013	90.8942	86.2570	76.0935	69.8682	63.3610	59.3643	62.6663	66.5377	73.7581	83.5010	92.0019	(72)
Total internal gains	537.2681	535.3681	518.2368	485.9254	453.8330	424.6707	407.3012	410.0959	426.4616	455.8298	491.4397	522.5958	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Southeast			5.4500		36.7938		0.3300		0.0000		0.7700		50.9538 (77)
Northeast			16.8300		11.2829		0.3100		0.0000		0.7700		45.3272 (75)
Northwest			2.1800		11.2829		0.3100		0.0000		0.7700		5.8713 (81)
Solar gains	102.1522	191.0090	306.5181	455.5045	579.3109	605.5200	571.1355	474.1229	357.3789	223.2850	125.4518	85.4170	(83)
Total gains	639.4203	726.3772	824.7548	941.4298	1033.1439	1030.1907	978.4366	884.2189	783.8405	679.1148	616.8915	608.0128	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.2172	61.3548	61.4931	62.1939	62.3360	63.0563	63.0563	63.2024	62.7662	62.3360	62.0525	61.7715	
alpha	5.0811	5.0903	5.0995	5.1463	5.1557	5.2038	5.2038	5.2135	5.1844	5.1557	5.1368	5.1181	
util living area	0.9932	0.9862	0.9648	0.8939	0.7410	0.5434	0.3999	0.4594	0.7266	0.9400	0.9869	0.9947	(86)
MIT	19.8046	19.9894	20.2929	20.6612	20.8998	20.9837	20.9973	20.9946	20.9334	20.5986	20.1317	19.7684	(87)
Th 2	19.9268	19.9289	19.9311	19.9418	19.9440	19.9547	19.9547	19.9569	19.9504	19.9440	19.9397	19.9354	(88)
util rest of house	0.9909	0.9816	0.9531	0.8617	0.6784	0.4600	0.3060	0.3576	0.6399	0.9139	0.9818	0.9929	(89)
MIT 2	18.5583	18.7937	19.1741	19.6189	19.8680	19.9465	19.9540	19.9552	19.9098	19.5615	18.9842	18.5185	(90)
Living area fraction										fLA = Living area / (4) =		0.3956	(91)
MIT	19.0514	19.2668	19.6167	20.0312	20.2762	20.3569	20.3667	20.3664	20.3148	19.9718	19.4382	19.0130	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0514	19.2668	19.6167	20.0312	20.2762	20.3569	20.3667	20.3664	20.3148	19.9718	19.4382	19.0130	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9884	0.9779	0.9489	0.8648	0.6991	0.4927	0.3432	0.3980	0.6718	0.9147	0.9785	0.9907	(94)
Useful gains	631.9813	710.3267	782.6273	814.1316	722.2908	507.5269	335.8274	351.9233	526.5989	621.2185	603.6354	602.3628	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1358.1549	1319.7738	1202.2346	1008.7517	775.4350	514.5734	336.6859	353.7171	558.0686	847.3687	1120.6787	1351.5863	(97)
Space heating kWh	540.2732	409.5485	312.1878	140.1265	39.5393	0.0000	0.0000	0.0000	0.0000	168.2558	372.2712	557.4223	(98a)
Space heating requirement - total per year (kWh/year)												2539.6246	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	540.2732	409.5485	312.1878	140.1265	39.5393	0.0000	0.0000	0.0000	0.0000	168.2558	372.2712	557.4223	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2539.6246	
Space heating per m2											(98c) / (4) =	32.8669	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	540.2732	409.5485	312.1878	140.1265	39.5393	0.0000	0.0000	0.0000	0.0000	168.2558	372.2712	557.4223	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	540.2732	409.5485	312.1878	140.1265	39.5393	0.0000	0.0000	0.0000	0.0000	168.2558	372.2712	557.4223	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	72.6371	64.1086	67.7800	58.8118	56.4797	50.3158	49.2372	51.5140	52.4355	59.1618	63.7545	71.7411	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.4348	13.9411	15.4348	14.9369	15.4348	14.9369	15.4348	15.4348	14.9369	15.4348	14.9369	15.4348	(231)
Lighting	21.9322	17.5948	15.8422	11.6066	8.9653	7.3247	8.1784	10.6307	13.8082	18.1171	20.4632	22.5417	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2539.6246	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	717.9771	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	181.7325	(230a)
Total electricity for the above, kWh/year	181.7325	(231)
Electricity for lighting (calculated in Appendix L)	177.0050	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3616.3392	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2539.6246	16.4900	418.7841	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	717.9771	16.4900	118.3944	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	181.7325	16.4900	29.9677	(249)
Energy for lighting	177.0050	16.4900	29.1881	(250)
Additional standing charges			0.0000	(251)
Total energy cost			596.3343	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.7558	(257)
SAP value		71.5387	
SAP rating (Section 12)		72	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2539.6246	0.1562	396.5699	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	717.9771	0.1412	101.3696	(264)
Space and water heating			497.9395	(265)
Pumps, fans and electric keep-hot	181.7325	0.1387	25.2085	(267)
Energy for lighting	177.0050	0.1443	25.5473	(268)
Total CO2, kg/year			548.6953	(272)
CO2 emissions per m2			7.1000	(273)
EI value			93.9867	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.2700	(1b)	x 2.5500	(2b) =	197.0385	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 77.2700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		197.0385	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9900	(17)
Infiltration rate		0.1495	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1271	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1366	0.1303	0.1303	0.1207	0.1239	0.1080	0.1080	0.1048	0.1080	0.1207	0.1175	0.1271	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	71.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2806	0.2743	0.2743	0.2647	0.2679	0.2520	0.2520	0.2488	0.2520	0.2647	0.2615	0.2711	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	98.4400	24.4600	73.9800	0.2100	15.5358	110.0000	8137.8003	(29a)
Communal Wall	17.4700	2.1500	15.3200	0.2200	3.3704	110.0000	1685.1999	(29a)
Lift Shaft	6.7600		6.7600	0.2500	1.6900	110.0000	743.6000	(29a)
Terrace Roof	29.3300		29.3300	0.1300	3.8129	9.0000	263.9700	(30)
Total net area of external elements Aum(A, m2)			152.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.7210			(33)
Main dwelling								
Party Wall 1			12.1500	0.0000	0.0000	110.0000	1336.5000	(32)
Party Floor 1			77.2700			70.0000	5408.9000	(32d)
Party Ceiling 1			47.9400			30.0000	1438.2000	(32b)
Internal Wall 1			141.8100			9.0000	1276.2900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 20290.4602	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	262.5917	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	54.3100	0.0380	2.0638
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P2 Party wall - Intermediate floor within a dwelling	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E15 Flat roof with parapet	18.6600	0.3000	5.5980
E10 Eaves (insulation at ceiling level)	2.5900	0.0630	0.1632
E1 Steel lintel with perforated steel base plate	11.2200	0.0500	0.5610
E4 Jamb	37.8000	0.0160	0.6048
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.4503 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	72.1713 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2457	17.8326	17.8326	17.2129	17.4195	16.3866	16.3866	16.1800	16.3866	17.2129	17.0063	17.6260	(38)
Heat transfer coeff	90.4170	90.0039	90.0039	89.3842	89.5908	88.5579	88.5579	88.3514	88.5579	89.3842	89.1776	89.7973	(39)
Average = Sum(39)m / 12 =												89.3153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1701	1.1648	1.1648	1.1568	1.1595	1.1461	1.1461	1.1434	1.1461	1.1568	1.1541	1.1621	(40)
HLP (average)												1.1559	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4090	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
64.6110	63.6401	62.2252	59.5180	57.5202	55.2922	54.0259	55.4300	56.9693	59.3615	62.1268	64.3635	(42a)

Hot water usage for baths

27.9081	27.4936	26.9099	25.8338	25.0279	24.1344	23.6518	24.2313	24.8624	25.8185	26.9169	27.8137	(42b)

Hot water usage for other uses

39.3008	37.8717	36.4425	35.0134	33.5843	32.1552	32.1552	33.5843	35.0134	36.4425	37.8717	39.3008	(42c)

Average daily hot water use (litres/day)	121.1724	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.8199	129.0053	125.5776	120.3652	116.1324	111.5818	109.8328	113.2457	116.8451	121.6225	126.9153	131.4780	(44)
Energy conte	208.7705	183.7019	193.0082	164.7739	156.3366	137.2029	132.8333	140.2218	144.0817	165.0406	180.8141	205.8628	(45)
Energy content (annual)										Total = Sum(45)m =		2012.6482	
Distribution loss (46)m = 0.15 x (45)m													
	31.3156	27.5553	28.9512	24.7161	23.4505	20.5804	19.9250	21.0333	21.6123	24.7561	27.1221	30.8794	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)
										Total per year (kWh/year) = Sum(64)m =		2329.9792	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					0.0000	(64a)
Heat gains from water heating, kWh/month													
	69.4162	61.0809	64.1752	54.7873	51.9819	45.6199	44.1671	46.6238	47.9072	54.8760	60.1207	68.4494	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.0569	22.2553	18.0992	13.7023	10.2426	8.6473	9.3437	12.1452	16.3013	20.6983	24.1579	25.7533	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	318.8663	322.1751	313.8370	296.0860	273.6786	252.6189	238.5496	235.2408	243.5790	261.3299	283.7373	304.7971	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	(71)
Water heating gains (Table 5)													
	93.3013	90.8942	86.2570	76.0935	69.8682	63.3610	59.3643	62.6663	66.5377	73.7581	83.5010	92.0019	(72)
Total internal gains													
	537.2681	535.3681	518.2368	485.9254	453.8330	424.6707	407.3012	410.0959	426.4616	455.8298	491.4397	522.5958	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
Northeast	16.8300	13.7804	0.3100	0.0000	0.7700	55.3604	(75)
Northwest	2.1800	13.7804	0.3100	0.0000	0.7700	7.1709	(81)

Solar gains	122.1616	200.5642	321.5614	487.2273	604.1786	667.7421	623.7565	530.9123	400.5240	252.2735	147.9919	102.6055	(83)
Total gains	659.4297	735.9324	839.7982	973.1526	1058.0115	1092.4128	1031.0576	941.0082	826.9856	708.1033	639.4316	625.2013	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.3360	62.6222	62.6222	63.0563	62.9109	63.6447	63.6447	63.7935	63.6447	63.0563	63.2024	62.7662	
alpha	5.1557	5.1748	5.1748	5.2038	5.1941	5.2430	5.2430	5.2529	5.2430	5.2038	5.2135	5.1844	
util living area													
	0.9902	0.9814	0.9505	0.8468	0.6522	0.4189	0.2832	0.3187	0.6184	0.9045	0.9793	0.9922	(86)
MIT	19.9568	20.1286	20.4333	20.7760	20.9526	20.9961	20.9996	20.9993	20.9734	20.7219	20.2893	19.9250	(87)
Th 2	19.9440	19.9483	19.9483	19.9547	19.9526	19.9634	19.9634	19.9655	19.9634	19.9547	19.9569	19.9504	(88)
util rest of house													
	0.9868	0.9751	0.9341	0.8037	0.5800	0.3368	0.1944	0.2220	0.5223	0.8648	0.9710	0.9894	(89)
MIT 2	18.7644	18.9839	19.3592	19.7553	19.9214	19.9620	19.9633	19.9654	19.9503	19.7096	19.1949	18.7291	(90)
Living area fraction										fLA = Living area / (4) =		0.3956	(91)
MIT	19.2361	19.4368	19.7842	20.1591	20.3294	20.3711	20.3733	20.3745	20.3550	20.1101	19.6278	19.2022	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2361	19.4368	19.7842	20.1591	20.3294	20.3711	20.3733	20.3745	20.3550	20.1101	19.6278	19.2022	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9712	0.9310	0.8129	0.6068	0.3693	0.2295	0.2603	0.5598	0.8716	0.9676	0.9868	(94)
Useful gains	648.7217	714.7429	781.8667	791.0619	642.0320	403.4067	236.6614	244.9732	462.9223	617.1899	618.6897	616.9447	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1278.1478	1236.3630	1114.6229	917.0033	665.6018	404.8083	236.7428	245.1279	474.2321	769.6087	1036.9429	1266.3393	(97)
Space heating kWh													
	468.2930	350.5287	247.5706	90.6778	17.5360	0.0000	0.0000	0.0000	0.0000	113.3996	301.1424	483.1496	(98a)
Space heating requirement - total per year (kWh/year)												2072.2976	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	468.2930	350.5287	247.5706	90.6778	17.5360	0.0000	0.0000	0.0000	0.0000	113.3996	301.1424	483.1496	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2072.2976	
Space heating per m2											(98c) / (4) =	26.8189	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	468.2930	350.5287	247.5706	90.6778	17.5360	0.0000	0.0000	0.0000	0.0000	113.3996	301.1424	483.1496	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	468.2930	350.5287	247.5706	90.6778	17.5360	0.0000	0.0000	0.0000	0.0000	113.3996	301.1424	483.1496	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	72.6371	64.1086	67.7800	58.8118	56.4797	50.3158	49.2372	51.5140	52.4355	59.1618	63.7545	71.7411	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.4348	13.9411	15.4348	14.9369	15.4348	14.9369	15.4348	15.4348	14.9369	15.4348	14.9369	15.4348	(231)
Lighting	21.9322	17.5948	15.8422	11.6066	8.9653	7.3247	8.1784	10.6307	13.8082	18.1171	20.4632	22.5417	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 2072.2976 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 717.9771 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)
mechanical ventilation fans (SFP = 0.7560) 181.7325 (230a)
Total electricity for the above, kWh/year 181.7325 (231)
Electricity for lighting (calculated in Appendix L) 177.0050 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 3149.0122 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2072.2976	27.6700	573.4047	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	717.9771	27.6700	198.6643	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	181.7325	27.6700	50.2854	(249)
Energy for lighting	177.0050	27.6700	48.9773	(250)
Additional standing charges			0.0000	(251)
Total energy cost			871.3317	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2072.2976	0.1569	325.2245	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	717.9771	0.1412	101.3696	(264)
Space and water heating			426.5942	(265)
Pumps, fans and electric keep-hot	181.7325	0.1387	25.2085	(267)
Energy for lighting	177.0050	0.1443	25.5473	(268)
Total CO2, kg/year			477.3500	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2072.2976	1.5810	3276.3060	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)

Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	717.9771	1.5221	1092.8154 (278)
Space and water heating			4369.1215 (279)
Pumps, fans and electric keep-hot	181.7325	1.5128	274.9250 (281)
Energy for lighting	177.0050	1.5338	271.4962 (282)
Total Primary energy kWh/year			4915.5427 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 72
Current environmental impact rating: A 94

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: C 72
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£871	£871	£0
Space heating	£624	£624	£0
Water heating	£199	£199	£0
Lighting	£49	£49	£0
Total cost of fuels	£871	£871	£0
Total cost of uses	£872	£872	£0
Delivered energy	41 kWh/m²	41 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	64 kWh/m²	64 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.2700	(1b)	x 2.5500	(2b) =	197.0385	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.0385	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9900 (17)
Infiltration rate		0.1495 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1271 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1620	0.1588	0.1557	0.1398	0.1366	0.1207	0.1207	0.1175	0.1271	0.1366	0.1430	0.1493	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 71.2000 (23c)

Effective ac	0.3060	0.3028	0.2997	0.2838	0.2806	0.2647	0.2647	0.2615	0.2711	0.2806	0.2870	0.2933	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	98.4400	24.4600	73.9800	0.2100	15.5358	110.0000	8137.8003	(29a)
Communal Wall	17.4700	2.1500	15.3200	0.2200	3.3704	110.0000	1685.1999	(29a)
Lift Shaft	6.7600		6.7600	0.2500	1.6900	110.0000	743.6000	(29a)
Terrace Roof	29.3300		29.3300	0.1300	3.8129	9.0000	263.9700	(30)
Total net area of external elements Aum(A, m2)			152.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.7210			(33)
Main dwelling								
Party Wall 1			12.1500	0.0000	0.0000	110.0000	1336.5000	(32)
Party Floor 1			77.2700			70.0000	5408.9000	(32d)
Party Ceiling 1			47.9400			30.0000	1438.2000	(32b)
Internal Wall 1			141.8100			9.0000	1276.2900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20290.4602 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 262.5917 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	54.3100	0.0380	2.0638
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P2 Party wall - Intermediate floor within a dwelling	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E15 Flat roof with parapet	18.6600	0.3000	5.5980
E10 Eaves (insulation at ceiling level)	2.5900	0.0630	0.1632
E1 Steel lintel with perforated steel base plate	11.2200	0.0500	0.5610
E4 Jamb	37.8000	0.0160	0.6048
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.4503 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 72.1713 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8983	19.6917	19.4851	18.4523	18.2457	17.2129	17.2129	17.0063	17.6260	18.2457	18.6589	19.0720	(38)
Heat transfer coeff	92.0696	91.8630	91.6565	90.6236	90.4170	89.3842	89.3842	89.1776	89.7973	90.4170	90.8302	91.2433	(39)

Average = Sum(39)m / 12 = 90.5720

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1915	1.1889	1.1862	1.1728	1.1701	1.1568	1.1568	1.1541	1.1621	1.1701	1.1755	1.1808	(40)
HLP (average)												1.1721	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4090 (42)
Hot water usage for mixer showers

64.6110	63.6401	62.2252	59.5180	57.5202	55.2922	54.0259	55.4300	56.9693	59.3615	62.1268	64.3635	(42a)

Hot water usage for baths

27.9081	27.4936	26.9099	25.8338	25.0279	24.1344	23.6518	24.2313	24.8624	25.8185	26.9169	27.8137	(42b)

Hot water usage for other uses

39.3008	37.8717	36.4425	35.0134	33.5843	32.1552	32.1552	33.5843	35.0134	36.4425	37.8717	39.3008	(42c)

Average daily hot water use (litres/day) 121.1724 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.8199	129.0053	125.5776	120.3652	116.1324	111.5818	109.8328	113.2457	116.8451	121.6225	126.9153	131.4780	(44)
Energy conte	208.7705	183.7019	193.0082	164.7739	156.3366	137.2029	132.8333	140.2218	144.0817	165.0406	180.8141	205.8628	(45)
Energy content (annual)										Total = Sum(45)m =		2012.6482	
Distribution loss (46)m = 0.15 x (45)m	31.3156	27.5553	28.9512	24.7161	23.4505	20.5804	19.9250	21.0333	21.6123	24.7561	27.1221	30.8794	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)

Total per year (kWh/year) = Sum(64)m = 2329.9792 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

69.4162	61.0809	64.1752	54.7873	51.9819	45.6199	44.1671	46.6238	47.9072	54.8760	60.1207	68.4494	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.0569	22.2553	18.0992	13.7023	10.2426	8.6473	9.3437	12.1452	16.3013	20.6983	24.1579	25.7533	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	318.8663	322.1751	313.8370	296.0860	273.6786	252.6189	238.5496	235.2408	243.5790	261.3299	283.7373	304.7971	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	(71)
Water heating gains (Table 5)													
	93.3013	90.8942	86.2570	76.0935	69.8682	63.3610	59.3643	62.6663	66.5377	73.7581	83.5010	92.0019	(72)
Total internal gains													
	537.2681	535.3681	518.2368	485.9254	453.8330	424.6707	407.3012	410.0959	426.4616	455.8298	491.4397	522.5958	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Northeast	16.8300	11.2829	0.3100	0.0000	0.7700	45.3272	(75)
Northwest	2.1800	11.2829	0.3100	0.0000	0.7700	5.8713	(81)

Solar gains	102.1522	191.0090	306.5181	455.5045	579.3109	605.5200	571.1355	474.1229	357.3789	223.2850	125.4518	85.4170	(83)
Total gains	639.4203	726.3772	824.7548	941.4298	1033.1439	1030.1907	978.4366	884.2189	783.8405	679.1148	616.8915	608.0128	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.2172	61.3548	61.4931	62.1939	62.3360	63.0563	63.0563	63.2024	62.7662	62.3360	62.0525	61.7715	
alpha	5.0811	5.0903	5.0995	5.1463	5.1557	5.2038	5.2038	5.2135	5.1844	5.1557	5.1368	5.1181	
util living area													
	0.9932	0.9862	0.9648	0.8939	0.7410	0.5434	0.3999	0.4594	0.7266	0.9400	0.9869	0.9947	(86)
MIT	19.8046	19.9894	20.2929	20.6612	20.8998	20.9837	20.9973	20.9946	20.9334	20.5986	20.1317	19.7684	(87)
Th 2	19.9268	19.9289	19.9311	19.9418	19.9440	19.9547	19.9547	19.9569	19.9504	19.9440	19.9397	19.9354	(88)
util rest of house													
	0.9909	0.9816	0.9531	0.8617	0.6784	0.4600	0.3060	0.3576	0.6399	0.9139	0.9818	0.9929	(89)
MIT 2	18.5583	18.7937	19.1741	19.6189	19.8680	19.9465	19.9540	19.9552	19.9098	19.5615	18.9842	18.5185	(90)
Living area fraction									fLA = Living area / (4) =			0.3956	(91)
MIT	19.0514	19.2668	19.6167	20.0312	20.2762	20.3569	20.3667	20.3664	20.3148	19.9718	19.4382	19.0130	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0514	19.2668	19.6167	20.0312	20.2762	20.3569	20.3667	20.3664	20.3148	19.9718	19.4382	19.0130	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9884	0.9779	0.9489	0.8648	0.6991	0.4927	0.3432	0.3980	0.6718	0.9147	0.9785	0.9907	(94)
Useful gains	631.9813	710.3267	782.6273	814.1316	722.2908	507.5269	335.8274	351.9233	526.5989	621.2185	603.6354	602.3628	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1358.1549	1319.7738	1202.2346	1008.7517	775.4350	514.5734	336.6859	353.7171	558.0686	847.3687	1120.6787	1351.5863	(97)
Space heating kWh													
	540.2732	409.5485	312.1878	140.1265	39.5393	0.0000	0.0000	0.0000	0.0000	168.2558	372.2712	557.4223	(98a)
Space heating requirement - total per year (kWh/year)												2539.6246	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	540.2732	409.5485	312.1878	140.1265	39.5393	0.0000	0.0000	0.0000	0.0000	168.2558	372.2712	557.4223	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2539.6246	
Space heating per m2											(98c) / (4) =	32.8669	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	540.2732	409.5485	312.1878	140.1265	39.5393	0.0000	0.0000	0.0000	0.0000	168.2558	372.2712	557.4223	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	540.2732	409.5485	312.1878	140.1265	39.5393	0.0000	0.0000	0.0000	0.0000	168.2558	372.2712	557.4223	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
235.7219 208.0451 219.9596 190.8559 183.2880 163.2849 159.7847 167.1732 170.1637 191.9920 206.8961 232.8142 (64)
Efficiency of water heater 324.5200 (216)
(217)m 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 (217)
Fuel for water heating, kWh/month
72.6371 64.1086 67.7800 58.8118 56.4797 50.3158 49.2372 51.5140 52.4355 59.1618 63.7545 71.7411 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 15.4348 13.9411 15.4348 14.9369 15.4348 14.9369 15.4348 15.4348 14.9369 15.4348 14.9369 15.4348 (231)
Lighting 21.9322 17.5948 15.8422 11.6066 8.9653 7.3247 8.1784 10.6307 13.8082 18.1171 20.4632 22.5417 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 2539.6246 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 717.9771 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)
mechanical ventilation fans (SFP = 0.7560) 181.7325 (230a)
Total electricity for the above, kWh/year 181.7325 (231)
Electricity for lighting (calculated in Appendix L) 177.0050 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 3616.3392 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2539.6246	16.4900	418.7841	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	717.9771	16.4900	118.3944	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	181.7325	16.4900	29.9677	(249)
Energy for lighting	177.0050	16.4900	29.1881	(250)
Additional standing charges			0.0000	(251)
Total energy cost			596.3343	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.7558 (257)
SAP value 71.5387
SAP rating (Section 12) 72 (258)
SAP band C

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2539.6246	0.1562	396.5699	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	717.9771	0.1412	101.3696	(264)
Space and water heating			497.9395	(265)
Pumps, fans and electric keep-hot	181.7325	0.1387	25.2085	(267)
Energy for lighting	177.0050	0.1443	25.5473	(268)
Total CO2, kg/year			548.6953	(272)
CO2 emissions per m2			7.1000	(273)
EI value			93.9867	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	77.2700	(1b)	x 2.5500	(2b) =	197.0385	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		197.0385	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9900 (17)
Infiltration rate		0.1495 (18)
Number of sides sheltered		2 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1271 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1366	0.1303	0.1303	0.1207	0.1239	0.1080	0.1080	0.1048	0.1080	0.1207	0.1175	0.1271	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	71.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2806	0.2743	0.2743	0.2647	0.2679	0.2520	0.2520	0.2488	0.2520	0.2647	0.2615	0.2711	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			5.4500	1.1450	6.2405			(27)
Window-Red			19.0100	1.2357	23.4914			(27)
Brickwork	98.4400	24.4600	73.9800	0.2100	15.5358	110.0000	8137.8003	(29a)
Communal Wall	17.4700	2.1500	15.3200	0.2200	3.3704	110.0000	1685.1999	(29a)
Lift Shaft	6.7600		6.7600	0.2500	1.6900	110.0000	743.6000	(29a)
Terrace Roof	29.3300		29.3300	0.1300	3.8129	9.0000	263.9700	(30)
Total net area of external elements Aum(A, m2)			152.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.7210			(33)
Main dwelling								
Party Wall 1			12.1500	0.0000	0.0000	110.0000	1336.5000	(32)
Party Floor 1			77.2700			70.0000	5408.9000	(32d)
Party Ceiling 1			47.9400			30.0000	1438.2000	(32b)
Internal Wall 1			141.8100			9.0000	1276.2900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	20290.4602 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	262.5917 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	54.3100	0.0380	2.0638
E16 Corner (normal)	17.1100	0.0540	0.9239
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P2 Party wall - Intermediate floor within a dwelling	7.6600	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E15 Flat roof with parapet	18.6600	0.3000	5.5980
E10 Eaves (insulation at ceiling level)	2.5900	0.0630	0.1632
E1 Steel lintel with perforated steel base plate	11.2200	0.0500	0.5610
E4 Jamb	37.8000	0.0160	0.6048
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	15.4503 (36)
Point Thermal bridges (36a) =	0.0000
Total fabric heat loss (33) + (36) + (36a) =	72.1713 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2457	17.8326	17.8326	17.2129	17.4195	16.3866	16.3866	16.1800	16.3866	17.2129	17.0063	17.6260	(38)
Heat transfer coeff	90.4170	90.0039	90.0039	89.3842	89.5908	88.5579	88.5579	88.3514	88.5579	89.3842	89.1776	89.7973	(39)
Average = Sum(39)m / 12 =												89.3153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1701	1.1648	1.1648	1.1568	1.1595	1.1461	1.1461	1.1434	1.1461	1.1568	1.1541	1.1621	(40)
HLP (average)												1.1559	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4090	(42)
Hot water usage for mixer showers													
	64.6110	63.6401	62.2252	59.5180	57.5202	55.2922	54.0259	55.4300	56.9693	59.3615	62.1268	64.3635	(42a)
Hot water usage for baths													
	27.9081	27.4936	26.9099	25.8338	25.0279	24.1344	23.6518	24.2313	24.8624	25.8185	26.9169	27.8137	(42b)
Hot water usage for other uses													
	39.3008	37.8717	36.4425	35.0134	33.5843	32.1552	32.1552	33.5843	35.0134	36.4425	37.8717	39.3008	(42c)
Average daily hot water use (litres/day)												121.1724	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	131.8199	129.0053	125.5776	120.3652	116.1324	111.5818	109.8328	113.2457	116.8451	121.6225	126.9153	131.4780	(44)
Energy conte	208.7705	183.7019	193.0082	164.7739	156.3366	137.2029	132.8333	140.2218	144.0817	165.0406	180.8141	205.8628	(45)
Energy content (annual)										Total = Sum(45)m =		2012.6482	
Distribution loss (46)m = 0.15 x (45)m													
	31.3156	27.5553	28.9512	24.7161	23.4505	20.5804	19.9250	21.0333	21.6123	24.7561	27.1221	30.8794	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)
									Total per year (kWh/year) = Sum(64)m =			2329.9792	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	69.4162	61.0809	64.1752	54.7873	51.9819	45.6199	44.1671	46.6238	47.9072	54.8760	60.1207	68.4494	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	144.5412	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.0569	22.2553	18.0992	13.7023	10.2426	8.6473	9.3437	12.1452	16.3013	20.6983	24.1579	25.7533	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	318.8663	322.1751	313.8370	296.0860	273.6786	252.6189	238.5496	235.2408	243.5790	261.3299	283.7373	304.7971	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	51.8631	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	-96.3608	(71)
Water heating gains (Table 5)													
	93.3013	90.8942	86.2570	76.0935	69.8682	63.3610	59.3643	62.6663	66.5377	73.7581	83.5010	92.0019	(72)
Total internal gains													
	537.2681	535.3681	518.2368	485.9254	453.8330	424.6707	407.3012	410.0959	426.4616	455.8298	491.4397	522.5958	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
Northeast	16.8300	13.7804	0.3100	0.0000	0.7700	55.3604	(75)
Northwest	2.1800	13.7804	0.3100	0.0000	0.7700	7.1709	(81)

Solar gains	122.1616	200.5642	321.5614	487.2273	604.1786	667.7421	623.7565	530.9123	400.5240	252.2735	147.9919	102.6055	(83)
Total gains	659.4297	735.9324	839.7982	973.1526	1058.0115	1092.4128	1031.0576	941.0082	826.9856	708.1033	639.4316	625.2013	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.3360	62.6222	62.6222	63.0563	62.9109	63.6447	63.6447	63.7935	63.6447	63.0563	63.2024	62.7662	
alpha	5.1557	5.1748	5.1748	5.2038	5.1941	5.2430	5.2430	5.2529	5.2430	5.2038	5.2135	5.1844	
util living area													
	0.9902	0.9814	0.9505	0.8468	0.6522	0.4189	0.2832	0.3187	0.6184	0.9045	0.9793	0.9922	(86)
MIT	19.9568	20.1286	20.4333	20.7760	20.9526	20.9961	20.9996	20.9993	20.9734	20.7219	20.2893	19.9250	(87)
Th 2	19.9440	19.9483	19.9483	19.9547	19.9526	19.9634	19.9634	19.9655	19.9634	19.9547	19.9569	19.9504	(88)
util rest of house													
	0.9868	0.9751	0.9341	0.8037	0.5800	0.3368	0.1944	0.2220	0.5223	0.8648	0.9710	0.9894	(89)
MIT 2	18.7644	18.9839	19.3592	19.7553	19.9214	19.9620	19.9633	19.9654	19.9503	19.7096	19.1949	18.7291	(90)
Living area fraction									fLA = Living area / (4) =			0.3956	(91)
MIT	19.2361	19.4368	19.7842	20.1591	20.3294	20.3711	20.3733	20.3745	20.3550	20.1101	19.6278	19.2022	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2361	19.4368	19.7842	20.1591	20.3294	20.3711	20.3733	20.3745	20.3550	20.1101	19.6278	19.2022	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9712	0.9310	0.8129	0.6068	0.3693	0.2295	0.2603	0.5598	0.8716	0.9676	0.9868	(94)
Useful gains	648.7217	714.7429	781.8667	791.0619	642.0320	403.4067	236.6614	244.9732	462.9223	617.1899	618.6897	616.9447	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1278.1478	1236.3630	1114.6229	917.0033	665.6018	404.8083	236.7428	245.1279	474.2321	769.6087	1036.9429	1266.3393	(97)
Space heating kWh	468.2930	350.5287	247.5706	90.6778	17.5360	0.0000	0.0000	0.0000	0.0000	113.3996	301.1424	483.1496	(98a)
Space heating requirement - total per year (kWh/year)												2072.2976	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	468.2930	350.5287	247.5706	90.6778	17.5360	0.0000	0.0000	0.0000	0.0000	113.3996	301.1424	483.1496	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2072.2976	
Space heating per m2											(98c) / (4) =	26.8189	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	468.2930	350.5287	247.5706	90.6778	17.5360	0.0000	0.0000	0.0000	0.0000	113.3996	301.1424	483.1496	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	468.2930	350.5287	247.5706	90.6778	17.5360	0.0000	0.0000	0.0000	0.0000	113.3996	301.1424	483.1496	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	235.7219	208.0451	219.9596	190.8559	183.2880	163.2849	159.7847	167.1732	170.1637	191.9920	206.8961	232.8142	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	72.6371	64.1086	67.7800	58.8118	56.4797	50.3158	49.2372	51.5140	52.4355	59.1618	63.7545	71.7411	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.4348	13.9411	15.4348	14.9369	15.4348	14.9369	15.4348	15.4348	14.9369	15.4348	14.9369	15.4348	(231)
Lighting	21.9322	17.5948	15.8422	11.6066	8.9653	7.3247	8.1784	10.6307	13.8082	18.1171	20.4632	22.5417	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2072.2976	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	717.9771	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	181.7325	(230a)
Total electricity for the above, kWh/year	181.7325	(231)
Electricity for lighting (calculated in Appendix L)	177.0050	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3149.0122	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2072.2976	27.6700	573.4047	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	717.9771	27.6700	198.6643	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	181.7325	27.6700	50.2854	(249)
Energy for lighting	177.0050	27.6700	48.9773	(250)
Additional standing charges			0.0000	(251)
Total energy cost			871.3317	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2072.2976	0.1569	325.2245	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	717.9771	0.1412	101.3696	(264)
Space and water heating			426.5942	(265)
Pumps, fans and electric keep-hot	181.7325	0.1387	25.2085	(267)
Energy for lighting	177.0050	0.1443	25.5473	(268)
Total CO2, kg/year			477.3500	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2072.2976	1.5810	3276.3060	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	717.9771	1.5221	1092.8154	(278)
Space and water heating			4369.1215	(279)
Pumps, fans and electric keep-hot	181.7325	1.5128	274.9250	(281)
Energy for lighting	177.0050	1.5338	271.4962	(282)
Total Primary energy kWh/year			4915.5427	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-05	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-05
Plot Address	Flat 5, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.84	**TER**	17.19
Environmental	95 A	**% DER < TER**			60.21
CO_2 Emissions (t/year)	0.31	**DFEE**	45.93	**TFEE**	50.28
Compliance Check	See BREL	**% DFEE < TFEE**			8.64
% DPER < TPER	22.47	**DPER**	70.65	**TPER**	91.12

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	228.79	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	28.96 m	55.18 m²	2.55 m

8.0 Living Area	27.44	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	65.79	52.19	0.00	None	13.60	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	17.16	15.01	0.50	Stairwell Access Corridor 1	2.15	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	8.89	8.89	0.50	Stairwell Access Corridor 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	11.22	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	86.48

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Terraced Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	25.43	25.43	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	28.75

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Other	0.00	55.18

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-GBY	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	South West	2.15	
Patio Door	Patio Door	Brickwork	South West	5.42	
West	Window-GBY	Brickwork	South West	2.72	
South	Window-GBY	Brickwork	South East	5.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	38.03	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	11.40	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.70	-0.10	-0.10	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	2.26	0.33	0.33	AbbeyCalculated	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	7.08	0.00	0.00		No
E18 Party wall between dwellings	Gov Approved Scheme	2.85	0.04	0.04		No
E25 Staggered party wall between dwellings	Gov Approved Scheme	5.70	0.03	0.03	RCD	No
E1 Steel lintel with perforated steel base plate	Independently assessed	6.69	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	23.40	0.02	0.02	RCD	Yes
E15 Flat roof with parapet	Table K1 - Default	17.67	0.30	0.30	tbc	No
E5 Ground floor (normal)	Gov Approved Scheme	42.11	0.11	0.11	RCD	No

Y-value	0.11	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	2
Manufacturer SFP	0.49
Duct Type	Rigid
MVHR Efficiency	90.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0

Summary for Input Data

elmhurst energy

Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.95	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	10

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes

Summary for Input Data

Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-05	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-05
Plot Address	Flat 5, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.84	**TER**	17.19
Environmental	95 A	**% DER < TER**			60.21
CO_2 Emissions (t/year)	0.31	**DFEE**	45.93	**TFEE**	50.28
Compliance Check	See BREL	**% DFEE < TFEE**			8.64
% DPER < TPER	22.47	**DPER**	70.65	**TPER**	91.12

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.7090	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9500 (17)
Infiltration rate		0.1475 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2999	0.2967	0.2936	0.2779	0.2748	0.2591	0.2591	0.2560	0.2654	0.2748	0.2810	0.2873	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Brickwork	65.7900	13.5900	52.2000	0.2100	10.9620	110.0000	5742.0001	(29a)
Communal Wall	17.1600	2.1500	15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Stairwell Wall	8.8900		8.8900	0.2200	1.9558	110.0000	977.9000	(29a)
Terraced Roof	25.4300		25.4300	0.1300	3.3059	9.0000	228.8700	(30)
Total net area of external elements Aum(A, m2)			117.2700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6670			(33)
Main dwelling								
Party Wall 1			11.2200	0.0000	0.0000	110.0000	1234.2000	(32)
Party Floor 1			55.1800			0.0000	0.0000	(32d)
Party Ceiling 1			28.7500			30.0000	862.5000	(32b)
Internal Wall 1			86.4800			9.0000	778.3200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11474.8902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 207.9538 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.0300	0.0380	1.4451
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.6900	0.0500	0.3345
E4 Jamb	23.4000	0.0160	0.3744
E15 Flat roof with parapet	17.6700	0.3000	5.3010
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.2649 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.9318 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.9234	13.7778	13.6323	12.9046	12.7590	12.0313	12.0313	11.8858	12.3224	12.7590	13.0501	13.3412	(38)
Heat transfer coeff	64.8552	64.7097	64.5641	63.8364	63.6909	62.9632	62.9632	62.8176	63.2542	63.6909	63.9820	64.2730	(39)
Average = Sum(39)m / 12 =												63.8000	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1753	1.1727	1.1701	1.1569	1.1542	1.1411	1.1411	1.1384	1.1463	1.1542	1.1595	1.1648	(40)
HLP (average)												1.1562	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)
Hot water usage for baths	23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)
Hot water usage for other uses	33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)
Average daily hot water use (litres/day)												103.3574	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
										Total per year (kWh/year) = Sum(64)m =		2034.0749	(64)
12Total per year (kWh/year)												2034	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0292	89.7109	81.0292	83.7301	81.0292	83.7301	81.0292	81.0292	83.7301	81.0292	83.7301	81.0292	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)
Total internal gains	371.9017	380.1975	363.3598	348.4483	329.1482	315.6885	302.4900	303.6393	313.8432	326.2441	348.5447	363.7049	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Southwest			5.4200		36.7938		0.3300		0.0000		0.7700		50.6733 (79)
Southeast			5.4500		36.7938		0.3300		0.0000		0.7700		50.9538 (77)
Southwest			2.7200		36.7938		0.3300		0.0000		0.7700		25.4301 (79)
Solar gains	127.0572	216.4254	296.1226	366.9103	410.9701	407.9982	393.3538	360.4832	320.6382	239.1961	152.1852	108.7345	(83)
Total gains	498.9589	596.6229	659.4824	715.3586	740.1182	723.6867	695.8437	664.1224	634.4813	565.4402	500.7299	472.4394	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	49.1475	49.2580	49.3691	49.9318	50.0459	50.6244	50.6244	50.7416	50.3914	50.0459	49.8183	49.5926	
alpha	4.2765	4.2839	4.2913	4.3288	4.3364	4.3750	4.3750	4.3828	4.3594	4.3364	4.3212	4.3062	
util living area	0.9801	0.9586	0.9221	0.8421	0.7128	0.5369	0.3938	0.4286	0.6393	0.8708	0.9617	0.9838	(86)
MIT	19.6760	19.9521	20.2680	20.6197	20.8551	20.9677	20.9933	20.9903	20.9309	20.6194	20.0881	19.6263	(87)
Th 2	19.9398	19.9419	19.9440	19.9547	19.9568	19.9674	19.9674	19.9696	19.9632	19.9568	19.9525	19.9483	(88)
util rest of house	0.9750	0.9486	0.9036	0.8068	0.6548	0.4579	0.3035	0.3357	0.5598	0.8333	0.9506	0.9796	(89)
MIT 2	18.4302	18.7761	19.1650	19.5856	19.8383	19.9486	19.9651	19.9659	19.9180	19.5984	18.9588	18.3736	(90)
Living area fraction										fLA = Living area / (4) =		0.4973	(91)
MIT	19.0497	19.3609	19.7135	20.0998	20.3439	20.4554	20.4764	20.4753	20.4217	20.1061	19.5204	18.9966	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0497	19.3609	19.7135	20.0998	20.3439	20.4554	20.4764	20.4753	20.4217	20.1061	19.5204	18.9966	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9419	0.8989	0.8121	0.6773	0.4960	0.3484	0.3818	0.5962	0.8393	0.9450	0.9746	(94)
Useful gains	483.7083	561.9632	592.8207	580.9504	501.3055	358.9535	242.4454	253.5769	378.2953	474.5676	473.2020	460.4597	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	956.5944	935.7616	853.1161	714.9550	550.5391	368.6718	244.0706	256.0028	399.8732	605.4541	794.6807	951.0199	(97)
Space heating kWh	351.8272	251.1925	193.6598	96.4833	36.6298	0.0000	0.0000	0.0000	0.0000	97.3796	231.4647	364.9768	(98a)
Space heating requirement - total per year (kWh/year)												1623.6136	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.8272	251.1925	193.6598	96.4833	36.6298	0.0000	0.0000	0.0000	0.0000	97.3796	231.4647	364.9768	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1623.6136	
Space heating per m2											(98c) / (4) =	29.4240	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.8272	251.1925	193.6598	96.4833	36.6298	0.0000	0.0000	0.0000	0.0000	97.3796	231.4647	364.9768	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	351.8272	251.1925	193.6598	96.4833	36.6298	0.0000	0.0000	0.0000	0.0000	97.3796	231.4647	364.9768	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.0017	9.0338	10.0017	9.6791	10.0017	9.6791	10.0017	10.0017	9.6791	10.0017	9.6791	10.0017	(231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1623.6136	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	626.7949	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6860)		
mechanical ventilation fans (SFP = 0.6860)	117.7622	(230a)
Total electricity for the above, kWh/year	117.7622	(231)
Electricity for lighting (calculated in Appendix L)	133.1010	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2501.2718	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1623.6136	0.1561	253.4868	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			341.9470	(265)
Pumps, fans and electric keep-hot	117.7622	0.1387	16.3351	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			377.4927	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.8400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1623.6136	1.5780	2562.0270	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	1.5219	953.8959	(278)
Space and water heating			3515.9229	(279)
Pumps, fans and electric keep-hot	117.7622	1.5128	178.1506	(281)
Energy for lighting	133.1010	1.5338	204.1547	(282)
Total Primary energy kWh/year			3898.2283	(286)
Dwelling Primary energy Rate (DPER)			70.6500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.7090	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1421	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3921	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3333	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)

Adj infilt rate													
	0.4250	0.4166	0.4083	0.3666	0.3583	0.3167	0.3167	0.3083	0.3333	0.3583	0.3750	0.3916	(22b)
Effective ac	0.5903	0.5868	0.5834	0.5672	0.5642	0.5501	0.5501	0.5475	0.5556	0.5642	0.5703	0.5767	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.6400	1.1450	13.3282			(27)
Brickwork	65.7900	11.6400	54.1500	0.1800	9.7470			(29a)
Communal Wall	17.1600	2.1500	15.0100	0.1800	2.7018			(29a)
Stairwell Wall	8.8900		8.8900	0.1800	1.6002			(29a)
Terraced Roof	25.4300		25.4300	0.1100	2.7973			(30)
Total net area of external elements Aum(A, m2)			117.2700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3245			(33)
Main dwelling								
Party Wall 1			11.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 207.9538 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	38.0300	0.0700	2.6621	
E16 Corner (normal)	11.4000	0.0900	1.0260	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.0200	0.0452	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000	
E18 Party wall between dwellings	2.8500	0.0600	0.1710	
E25 Staggered party wall between dwellings	5.7000	0.0600	0.3420	
E1 Steel lintel with perforated steel base plate	6.6900	0.0500	0.3345	
E4 Jamb	23.4000	0.0500	1.1700	
E15 Flat roof with parapet	17.6700	0.5600	9.8952	
E5 Ground floor (normal)	42.1100	0.1600	6.7376	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.8706 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 54.1951 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.4101	27.2473	27.0877	26.3381	26.1978	25.5449	25.5449	25.4240	25.7964	26.1978	26.4815	26.7782	(38)
Heat transfer coeff													
	81.6053	81.4425	81.2829	80.5332	80.3930	79.7400	79.7400	79.6191	79.9915	80.3930	80.6767	80.9733	(39)
Average = Sum(39)m / 12 =												80.5325	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4789	1.4759	1.4730	1.4595	1.4569	1.4451	1.4451	1.4429	1.4496	1.4569	1.4621	1.4674	(40)
HLP (average)												1.4595	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)

Hot water usage for mixer showers

55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m													
	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

224.6708	198.7794	211.2272	185.6408	179.9472	162.1236	159.8990	166.2009	167.9899	187.3702	199.3217	222.1905	(62)
-25.1960	-22.2836	-23.3341	-19.3215	-18.0070	-15.4087	-14.4432	-15.3589	-15.9424	-18.7944	-21.2917	-24.7294	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

199.4748	176.4959	187.8932	166.3193	161.9403	146.7149	145.4558	150.8420	152.0474	168.5759	178.0300	197.4611	(64)
									Total per year (kWh/year) = Sum(64)m =		2031.2506	(64)

12Total per year (kWh/year) 2031 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

96.4862	85.7692	92.0162	82.8060	81.6156	74.9865	74.9495	77.0449	76.9371	84.0837	87.3549	95.6615	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.2264	89.9293	81.2264	83.9340	81.2264	83.9340	81.2264	81.2264	83.9340	81.2264	83.9340	81.2264	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053 (71)

Water heating gains (Table 5)

	129.6857	127.6328	123.6776	115.0084	109.6984	104.1480	100.7386	103.5550	106.8570	113.0158	121.3262	128.5772 (72)

Total internal gains

	425.2010	433.5180	416.6591	401.7542	382.4475	365.9944	352.7893	353.9386	364.1490	379.5434	401.8506	417.0043 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	4.6700	36.7938	0.6300	0.7000	0.7700	52.5126 (77)
Southwest	6.9700	36.7938	0.6300	0.7000	0.7700	78.3754 (79)

Solar gains	130.8880	222.9507	305.0509	377.9728	423.3610	420.2995	405.2136	371.3519	330.3056	246.4080	156.7737	112.0129 (83)
Total gains	556.0890	656.4686	721.7099	779.7270	805.8085	786.2939	758.0028	725.2905	694.4546	625.9514	558.6243	529.0171 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.0596	39.1377	39.2145	39.5796	39.6486	39.9733	39.9733	40.0340	39.8476	39.6486	39.5092	39.3644	
alpha	3.6040	3.6092	3.6143	3.6386	3.6432	3.6649	3.6649	3.6689	3.6565	3.6432	3.6339	3.6243	
util living area													
	0.9762	0.9571	0.9265	0.8622	0.7543	0.5951	0.4477	0.4837	0.6876	0.8816	0.9585	0.9798	(86)
MIT	19.2816	19.5680	19.9301	20.3643	20.7057	20.9106	20.9757	20.9675	20.8431	20.4016	19.7678	19.2313	(87)
Th 2	19.7034	19.7056	19.7078	19.7180	19.7200	19.7289	19.7289	19.7306	19.7255	19.7200	19.7161	19.7120	(88)
util rest of house													
	0.9698	0.9460	0.9071	0.8257	0.6901	0.4963	0.3254	0.3598	0.5942	0.8419	0.9456	0.9743	(89)
MIT 2	17.7733	18.1320	18.5800	19.1041	19.4804	19.6781	19.7212	19.7191	19.6244	19.1631	18.3951	17.7158	(90)
Living area fraction										fLA = Living area / (4) =		0.4973	(91)
MIT	18.5233	18.8461	19.2513	19.7308	20.0897	20.2910	20.3450	20.3399	20.2304	19.7790	19.0777	18.4694	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5233	18.8461	19.2513	19.7308	20.0897	20.2910	20.3450	20.3399	20.2304	19.7790	19.0777	18.4694	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9620	0.9366	0.8989	0.8261	0.7101	0.5419	0.3860	0.4209	0.6337	0.8441	0.9375	0.9672	(94)
Useful gains	534.9500	614.8378	648.7300	644.1115	572.2200	426.0691	292.5933	305.3029	440.0437	528.3410	523.6988	511.6462	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1160.6975	1135.8010	1036.4656	872.2378	674.4768	453.8006	298.6287	313.6918	490.3810	737.9281	966.3252	1155.4438	(97)
Space heating kWh													
	465.5562	350.0873	288.4752	164.2509	76.0791	0.0000	0.0000	0.0000	0.0000	155.9328	318.6910	478.9854	(98a)
Space heating requirement - total per year (kWh/year)												2298.0580	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	465.5562	350.0873	288.4752	164.2509	76.0791	0.0000	0.0000	0.0000	0.0000	155.9328	318.6910	478.9854	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2298.0580	
Space heating per m2											(98c) / (4) =	41.6466	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	465.5562	350.0873	288.4752	164.2509	76.0791	0.0000	0.0000	0.0000	0.0000	155.9328	318.6910	478.9854	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	504.3946	379.2929	312.5409	177.9533	82.4259	0.0000	0.0000	0.0000	0.0000	168.9413	345.2774	518.9441	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	199.4748	176.4959	187.8932	166.3193	161.9403	146.7149	145.4558	150.8420	152.0474	168.5759	178.0300	197.4611	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8943	85.5655	85.0180	84.0317	82.4717	79.8000	79.8000	79.8000	79.8000	83.8853	85.3500	85.9697	(217)
Fuel for water heating, kWh/month													
	232.2329	206.2699	221.0039	197.9244	196.3586	183.8533	182.2755	189.0251	190.5356	200.9599	208.5882	229.6868	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8772	13.5396	12.1909	8.9316	6.8990	5.6365	6.2935	8.1805	10.6257	13.9415	15.7469	17.3463	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233a)m	-18.9353	-27.6452	-41.1463	-47.9756	-53.2444	-50.2766	-49.6853	-46.1688	-40.2019	-32.3915	-21.1605	-16.2634	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9962	-17.0698	-34.3839	-52.3054	-69.7949	-70.3346	-69.4830	-58.5220	-42.5053	-24.6035	-10.7401	-6.3030	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2489.7703	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2438.7142	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	136.2091	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-909.1366	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4241.5570	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2489.7703	0.2100	522.8518	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2438.7142	0.2100	512.1300	(264)
Space and water heating			1034.9817	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.2091	0.1443	19.6592	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-445.0948	0.1338	-59.5691	
PV Unit electricity exported	-464.0418	0.1255	-58.2521	
Total			-117.8211	(269)
Total CO2, kg/year			948.7491	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.1900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2489.7703	1.1300	2813.4404	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2438.7142	1.1300	2755.7471	(278)
Space and water heating			5569.1875	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.2091	1.5338	208.9220	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-445.0948	1.4946	-665.2329	
PV Unit electricity exported	-464.0418	0.4608	-213.8175	
Total			-879.0505	(283)
Total Primary energy kWh/year			5029.1598	(286)
Target Primary Energy Rate (TPER)			91.1400	(287)

Full SAP Calculation Printout

Plot Reference	P-05	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-05
Plot Address	Flat 5, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.84	**TER**	17.19
Environmental	95 A	**% DER < TER**			60.21
CO_2 Emissions (t/year)	0.31	**DFEE**	45.93	**TFEE**	50.28
Compliance Check	See BREL	**% DFEE < TFEE**			8.64
% DPER < TPER	22.47	**DPER**	70.65	**TPER**	91.12

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.7090	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1421 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.9500 (17)
Infiltration rate			0.2896 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2462 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3139	0.3077	0.3016	0.2708	0.2647	0.2339	0.2339	0.2277	0.2462	0.2647	0.2770	0.2893	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5493	0.5474	0.5455	0.5367	0.5350	0.5274	0.5274	0.5259	0.5303	0.5350	0.5384	0.5418	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Brickwork	65.7900	13.5900	52.2000	0.2100	10.9620	110.0000	5742.0001	(29a)
Communal Wall	17.1600	2.1500	15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Stairwell Wall	8.8900		8.8900	0.2200	1.9558	110.0000	977.9000	(29a)
Terraced Roof	25.4300		25.4300	0.1300	3.3059	9.0000	228.8700	(30)
Total net area of external elements Aum(A, m2)			117.2700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6670			(33)
Main dwelling								
Party Wall 1			11.2200	0.0000	0.0000	110.0000	1234.2000	(32)
Party Floor 1			55.1800			0.0000	0.0000	(32d)
Party Ceiling 1			28.7500			30.0000	862.5000	(32b)
Internal Wall 1			86.4800			9.0000	778.3200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11474.8902	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							207.9538	(35)
List of Thermal Bridges								

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.0300	0.0380	1.4451
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.9900	0.0500	0.3345
E4 Jamb	23.4000	0.0160	0.3744
E15 Flat roof with parapet	17.6700	0.3000	5.3010
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.2649 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.9318 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.5045	25.4157	25.3286	24.9197	24.8432	24.4870	24.4870	24.4210	24.6242	24.8432	24.9980	25.1598	(38)
Heat transfer coeff	76.4364	76.3475	76.2605	75.8515	75.7750	75.4188	75.4188	75.3528	75.5560	75.7750	75.9298	76.0916	(39)
Average = Sum(39)m / 12 =												75.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3852	1.3836	1.3820	1.3746	1.3732	1.3668	1.3668	1.3656	1.3693	1.3732	1.3760	1.3790	(40)
HLP (average)												1.3746	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 52.5437 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.3246	55.7526	54.0361	51.8993	49.9931	48.0122	47.6002	49.3131	51.0700	53.1044	55.2602	57.2441	(44)
Energy conte	90.7882	79.3910	83.0515	71.0475	67.3004	59.0366	57.5683	61.0599	62.9745	72.0622	78.7283	89.6304	(45)
Energy content (annual)										Total = Sum(45)m =		872.6387	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	77.1700	67.4823	70.5938	60.3904	57.2053	50.1811	48.9330	51.9010	53.5283	61.2529	66.9191	76.1858	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	77.1700	67.4823	70.5938	60.3904	57.2053	50.1811	48.9330	51.9010	53.5283	61.2529	66.9191	76.1858	(64)
										Total per year (kWh/year) = Sum(64)m =		741.7429	(64)
12Total per year (kWh/year)												742	(64)
Electric shower(s)	44.1375	39.3268	42.9434	40.9804	41.7493	39.8248	41.1523	41.7493	40.9804	42.9434	42.1359	44.1375	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		502.0610	(64a)
Heat gains from water heating, kWh/month	30.3269	26.7023	28.3843	25.3427	24.7387	22.5015	22.5213	23.4126	23.6272	26.0491	27.2637	30.0808	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0292	89.7109	81.0292	83.7301	81.0292	83.7301	81.0292	81.0292	83.7301	81.0292	83.7301	81.0292	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)	40.7619	39.7355	38.1509	35.1982	33.2509	31.2520	30.2706	31.4685	32.8155	35.0122	37.8663	40.4312	(72)
Total internal gains	333.0799	342.4023	327.9351	318.7402	302.8028	292.8947	282.1240	281.6548	289.9037	298.3426	315.1868	325.6610	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(79)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Southwest	2.7200	36.7938	0.3300	0.0000	0.7700	25.4301	(79)

Solar gains	127.0572	216.4254	296.1226	366.9103	410.9701	407.9982	393.3538	360.4832	320.6382	239.1961	152.1852	108.7345	(83)
Total gains	460.1371	558.8277	624.0577	685.6504	713.7728	700.8928	675.4777	642.1380	610.5418	537.5387	467.3720	434.3954	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.7009	41.7495	41.7971	42.0225	42.0649	42.2636	42.2636	42.3006	42.1868	42.0649	41.9792	41.8899	
alpha	3.7801	3.7833	3.7865	3.8015	3.8043	3.8176	3.8176	3.8200	3.8125	3.8043	3.7986	3.7927	
util living area	0.9864	0.9717	0.9466	0.8892	0.7868	0.6268	0.4741	0.5150	0.7256	0.9118	0.9742	0.9889	(86)
MIT	19.2436	19.5345	19.8997	20.3407	20.6937	20.9071	20.9752	20.9658	20.8322	20.3624	19.7164	19.1856	(87)
Th 2	19.7747	19.7759	19.7771	19.7828	19.7839	19.7889	19.7889	19.7898	19.7870	19.7839	19.7818	19.7795	(88)
util rest of house	0.9826	0.9641	0.9319	0.8582	0.7275	0.5300	0.3516	0.3906	0.6368	0.8801	0.9659	0.9858	(89)
MIT 2	18.2146	18.5009	18.8564	19.2756	19.5842	19.7463	19.7824	19.7800	19.6994	19.3070	18.6877	18.1607	(90)
Living area fraction										fLA = Living area / (4) =		0.4973	(91)
MIT	18.7263	19.0149	19.3752	19.8053	20.1359	20.3235	20.3756	20.3697	20.2627	19.8318	19.1992	18.6704	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7263	19.0149	19.3752	19.8053	20.1359	20.3235	20.3756	20.3697	20.2627	19.8318	19.1992	18.6704	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9783	0.9580	0.9260	0.8588	0.7461	0.5747	0.4124	0.4520	0.6742	0.8816	0.9608	0.9820	(94)
Useful gains	450.1310	535.3836	577.9014	588.8533	532.5578	402.8073	278.5629	290.2698	411.6358	473.8870	449.0340	426.5778	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1102.6951	1077.6363	981.8682	827.1815	639.2324	431.6608	284.7485	299.1253	465.6293	699.5422	918.6926	1101.0729	(97)
Space heating kWh	485.5076	364.3938	300.5513	171.5963	79.3659	0.0000	0.0000	0.0000	0.0000	167.8875	338.1542	501.8243	(98a)
Space heating requirement - total per year (kWh/year)												2409.2809	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	485.5076	364.3938	300.5513	171.5963	79.3659	0.0000	0.0000	0.0000	0.0000	167.8875	338.1542	501.8243	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2409.2809	
Space heating per m2										(98c) / (4) =		43.6622	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	708.9367	558.0991	572.6816	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8330	0.8950	0.8741	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	590.5219	499.5206	500.5841	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	789.9335	761.8267	724.4133	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	143.5764	195.1557	166.5289	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.8941	48.7889	41.6322	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												126.3152	(107)
Energy for space heating												43.6622	(99)
Energy for space cooling												2.2891	(108)
Total												45.9514	(109)
Fabric Energy Efficiency (DFEE)												46.0	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.7090	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)

Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1421 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3921 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3333 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4250	0.4166	0.4083	0.3666	0.3583	0.3167	0.3167	0.3083	0.3333	0.3583	0.3750	0.3916	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5903	0.5868	0.5834	0.5672	0.5642	0.5501	0.5501	0.5475	0.5556	0.5642	0.5703	0.5767	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.6400	1.1450	13.3282			(27)
Brickwork	65.7900	11.6400	54.1500	0.1800	9.7470			(29a)
Communal Wall	17.1600	2.1500	15.0100	0.1800	2.7018			(29a)
Stairwell Wall	8.8900		8.8900	0.1800	1.6002			(29a)
Terraced Roof	25.4300		25.4300	0.1100	2.7973			(30)
Total net area of external elements Aum(A, m2)			117.2700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3245			(33)
Main dwelling								
Party Wall 1			11.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 207.9538 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.0300	0.0700	2.6621
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.0200	0.0452
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	5.7000	0.0600	0.3420
E1 Steel lintel with perforated steel base plate	6.6900	0.0500	0.3345
E4 Jamb	23.4000	0.0500	1.1700
E15 Flat roof with parapet	17.6700	0.5600	9.8952
E5 Ground floor (normal)	42.1100	0.1600	6.7376

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.8706 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.1951 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.4101	27.2473	27.0877	26.3381	26.1978	25.5449	25.5449	25.4240	25.7964	26.1978	26.4815	26.7782	(38)
Heat transfer coeff	81.6053	81.4425	81.2829	80.5332	80.3930	79.7400	79.7400	79.6191	79.9915	80.3930	80.6767	80.9733	(39)

Average = Sum(39)m / 12 = 80.5325

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4789	1.4759	1.4730	1.4595	1.4569	1.4451	1.4451	1.4429	1.4496	1.4569	1.4621	1.4674	(40)
HLP (average)												1.4595	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 52.5437 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.3246	55.7526	54.0361	51.8993	49.9931	48.0122	47.6002	49.3131	51.0700	53.1044	55.2602	57.2441	(44)
Energy conte	90.7882	79.3910	83.0515	71.0475	67.3004	59.0366	57.5683	61.0599	62.9745	72.0622	78.7283	89.6304	(45)

Energy content (annual) Total = Sum(45)m = 872.6387

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

77.1700	67.4823	70.5938	60.3904	57.2053	50.1811	48.9330	51.9010	53.5283	61.2529	66.9191	76.1858	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

77.1700	67.4823	70.5938	60.3904	57.2053	50.1811	48.9330	51.9010	53.5283	61.2529	66.9191	76.1858	(64)

Total per year (kWh/year) = Sum(64)m = 741.7429 (64)

12Total per year (kWh/year) 742 (64)
Electric shower(s)

	44.1375	39.3268	42.9434	40.9804	41.7493	39.8248	41.1523	41.7493	40.9804	42.9434	42.1359	44.1375	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												502.0610	(64a)
Heat gains from water heating, kWh/month													
	30.3269	26.7023	28.3843	25.3427	24.7387	22.5015	22.5213	23.4126	23.6272	26.0491	27.2637	30.0808	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.2264	89.9293	81.2264	83.9340	81.2264	83.9340	81.2264	81.2264	83.9340	81.2264	83.9340	81.2264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)													
	40.7619	39.7355	38.1509	35.1982	33.2509	31.2520	30.2706	31.4685	32.8155	35.0122	37.8663	40.4312	(72)
Total internal gains													
	333.2772	342.6207	328.1324	318.9440	303.0000	293.0985	282.3212	281.8521	290.1075	298.5398	315.3907	325.8582	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.6700	36.7938	0.6300	0.7000	0.7700	52.5126	(77)
Southwest	6.9700	36.7938	0.6300	0.7000	0.7700	78.3754	(79)

Solar gains	130.8880	222.9507	305.0509	377.9728	423.3610	420.2995	405.2136	371.3519	330.3056	246.4080	156.7737	112.0129	(83)
Total gains	464.1652	565.5714	633.1833	696.9168	726.3610	713.3980	687.5348	653.2040	620.4131	544.9478	472.1643	437.8711	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.0596	39.1377	39.2145	39.5796	39.6486	39.9733	39.9733	40.0340	39.8476	39.6486	39.5092	39.3644	
alpha	3.6040	3.6092	3.6143	3.6386	3.6432	3.6649	3.6649	3.6689	3.6565	3.6432	3.6339	3.6243	
util living area													
	0.9863	0.9721	0.9481	0.8934	0.7958	0.6399	0.4881	0.5291	0.7372	0.9152	0.9746	0.9888	(86)
MIT	19.1033	19.4033	19.7866	20.2598	20.6430	20.8864	20.9678	20.9564	20.8006	20.2899	19.6096	19.0520	(87)
Th 2	19.7034	19.7056	19.7078	19.7180	19.7200	19.7289	19.7289	19.7306	19.7255	19.7200	19.7161	19.7120	(88)
util rest of house													
	0.9824	0.9644	0.9333	0.8623	0.7356	0.5389	0.3572	0.3970	0.6460	0.8835	0.9661	0.9856	(89)
MIT 2	18.0247	18.3208	18.6952	19.1495	19.4876	19.6771	19.7207	19.7182	19.6217	19.1902	18.5351	17.9802	(90)
Living area fraction										fLA = Living area / (4) =		0.4973	(91)
MIT	18.5611	18.8591	19.2379	19.7016	20.0621	20.2785	20.3409	20.3340	20.2079	19.7370	19.0694	18.5132	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5611	18.8591	19.2379	19.7016	20.0621	20.2785	20.3409	20.3340	20.2079	19.7370	19.0694	18.5132	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9778	0.9579	0.9267	0.8618	0.7533	0.5849	0.4221	0.4621	0.6834	0.8840	0.9606	0.9815	(94)
Useful gains	453.8538	541.7480	586.7993	600.6360	547.1596	417.2796	290.2158	301.8583	424.0062	481.7501	453.5671	429.7799	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1163.7780	1136.8607	1035.3748	869.8881	672.2578	452.8026	298.2962	313.2191	488.5838	734.5527	965.6520	1158.9850	(97)
Space heating kWh													
	528.1836	399.9158	333.7401	193.8615	93.0731	0.0000	0.0000	0.0000	0.0000	188.0852	368.7011	542.5286	(98a)
Space heating requirement - total per year (kWh/year)												2648.0891	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	528.1836	399.9158	333.7401	193.8615	93.0731	0.0000	0.0000	0.0000	0.0000	188.0852	368.7011	542.5286	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2648.0891	
Space heating per m2											(98c) / (4) =	47.9900	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	749.5564	590.0763	605.1054	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8124	0.8782	0.8558	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	608.9614	518.1854	517.8468	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	804.3290	775.7075	737.1412	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	140.6647	191.5964	163.1551	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	35.1662	47.8991	40.7888	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												123.8540	(107)
Energy for space heating												47.9900	(99)

Energy for space cooling	2.2445 (108)
Total	50.2346 (109)
Fabric Energy Efficiency (TFEE)	50.2 (109)

Full SAP Calculation Printout

Plot Reference	P-05	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-05
Plot Address	Flat 5, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.84	**TER**	17.19
Environmental	95 A	**% DER < TER**			60.21
CO_2 Emissions (t/year)	0.31	**DFEE**	45.93	**TFEE**	50.28
Compliance Check	See BREL	**% DFEE < TFEE**			8.64
% DPER < TPER	22.47	**DPER**	70.65	**TPER**	91.12

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.7090	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9500 (17)
Infiltration rate		0.1475 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2999	0.2967	0.2936	0.2779	0.2748	0.2591	0.2591	0.2560	0.2654	0.2748	0.2810	0.2873	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Brickwork	65.7900	13.5900	52.2000	0.2100	10.9620	110.0000	5742.0001	(29a)
Communal Wall	17.1600	2.1500	15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Stairwell Wall	8.8900		8.8900	0.2200	1.9558	110.0000	977.9000	(29a)
Terraced Roof	25.4300		25.4300	0.1300	3.3059	9.0000	228.8700	(30)
Total net area of external elements Aum(A, m2)			117.2700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6670			(33)
Main dwelling								
Party Wall 1			11.2200	0.0000	0.0000	110.0000	1234.2000	(32)
Party Floor 1			55.1800			0.0000	0.0000	(32d)
Party Ceiling 1			28.7500			30.0000	862.5000	(32b)
Internal Wall 1			86.4800			9.0000	778.3200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11474.8902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 207.9538 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.0300	0.0380	1.4451
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.6900	0.0500	0.3345
E4 Jamb	23.4000	0.0160	0.3744
E15 Flat roof with parapet	17.6700	0.3000	5.3010
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.2649 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.9318 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.9234	13.7778	13.6323	12.9046	12.7590	12.0313	12.0313	11.8858	12.3224	12.7590	13.0501	13.3412	(38)
Heat transfer coeff	64.8552	64.7097	64.5641	63.8364	63.6909	62.9632	62.9632	62.8176	63.2542	63.6909	63.9820	64.2730	(39)
Average = Sum(39)m / 12 =												63.8000	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1753	1.1727	1.1701	1.1569	1.1542	1.1411	1.1411	1.1384	1.1463	1.1542	1.1595	1.1648	(40)
HLP (average)												1.1562	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)
Hot water usage for baths	23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)
Hot water usage for other uses	33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)
Average daily hot water use (litres/day)												103.3574	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
										Total per year (kWh/year) = Sum(64)m =		2034.0749	(64)
12Total per year (kWh/year)												2034	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0292	89.7109	81.0292	83.7301	81.0292	83.7301	81.0292	81.0292	83.7301	81.0292	83.7301	81.0292	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)
Total internal gains	371.9017	380.1975	363.3598	348.4483	329.1482	315.6885	302.4900	303.6393	313.8432	326.2441	348.5447	363.7049	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Southwest			5.4200		36.7938		0.3300		0.0000		0.7700		50.6733 (79)
Southeast			5.4500		36.7938		0.3300		0.0000		0.7700		50.9538 (77)
Southwest			2.7200		36.7938		0.3300		0.0000		0.7700		25.4301 (79)
Solar gains	127.0572	216.4254	296.1226	366.9103	410.9701	407.9982	393.3538	360.4832	320.6382	239.1961	152.1852	108.7345	(83)
Total gains	498.9589	596.6229	659.4824	715.3586	740.1182	723.6867	695.8437	664.1224	634.4813	565.4402	500.7299	472.4394	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	49.1475	49.2580	49.3691	49.9318	50.0459	50.6244	50.6244	50.7416	50.3914	50.0459	49.8183	49.5926	
alpha	4.2765	4.2839	4.2913	4.3288	4.3364	4.3750	4.3750	4.3828	4.3594	4.3364	4.3212	4.3062	
util living area	0.9801	0.9586	0.9221	0.8421	0.7128	0.5369	0.3938	0.4286	0.6393	0.8708	0.9617	0.9838	(86)
MIT	19.6760	19.9521	20.2680	20.6197	20.8551	20.9677	20.9933	20.9903	20.9309	20.6194	20.0881	19.6263	(87)
Th 2	19.9398	19.9419	19.9440	19.9547	19.9568	19.9674	19.9674	19.9696	19.9632	19.9568	19.9525	19.9483	(88)
util rest of house	0.9750	0.9486	0.9036	0.8068	0.6548	0.4579	0.3035	0.3357	0.5598	0.8333	0.9506	0.9796	(89)
MIT 2	18.4302	18.7761	19.1650	19.5856	19.8383	19.9486	19.9651	19.9659	19.9180	19.5984	18.9588	18.3736	(90)
Living area fraction										fLA = Living area / (4) =		0.4973	(91)
MIT	19.0497	19.3609	19.7135	20.0998	20.3439	20.4554	20.4764	20.4753	20.4217	20.1061	19.5204	18.9966	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0497	19.3609	19.7135	20.0998	20.3439	20.4554	20.4764	20.4753	20.4217	20.1061	19.5204	18.9966	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9419	0.8989	0.8121	0.6773	0.4960	0.3484	0.3818	0.5962	0.8393	0.9450	0.9746	(94)
Useful gains	483.7083	561.9632	592.8207	580.9504	501.3055	358.9535	242.4454	253.5769	378.2953	474.5676	473.2020	460.4597	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	956.5944	935.7616	853.1161	714.9550	550.5391	368.6718	244.0706	256.0028	399.8732	605.4541	794.6807	951.0199	(97)
Space heating kWh	351.8272	251.1925	193.6598	96.4833	36.6298	0.0000	0.0000	0.0000	0.0000	97.3796	231.4647	364.9768	(98a)
Space heating requirement - total per year (kWh/year)												1623.6136	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.8272	251.1925	193.6598	96.4833	36.6298	0.0000	0.0000	0.0000	0.0000	97.3796	231.4647	364.9768	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1623.6136	
Space heating per m2											(98c) / (4) =	29.4240	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.8272	251.1925	193.6598	96.4833	36.6298	0.0000	0.0000	0.0000	0.0000	97.3796	231.4647	364.9768	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	351.8272	251.1925	193.6598	96.4833	36.6298	0.0000	0.0000	0.0000	0.0000	97.3796	231.4647	364.9768	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.0017	9.0338	10.0017	9.6791	10.0017	9.6791	10.0017	10.0017	9.6791	10.0017	9.6791	10.0017	(231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1623.6136	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	626.7949	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6860)		
mechanical ventilation fans (SFP = 0.6860)	117.7622	(230a)
Total electricity for the above, kWh/year	117.7622	(231)
Electricity for lighting (calculated in Appendix L)	133.1010	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2501.2718	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1623.6136	0.1561	253.4868	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			341.9470	(265)
Pumps, fans and electric keep-hot	117.7622	0.1387	16.3351	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			377.4927	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.8400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1623.6136	1.5780	2562.0270	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	1.5219	953.8959	(278)
Space and water heating			3515.9229	(279)
Pumps, fans and electric keep-hot	117.7622	1.5128	178.1506	(281)
Energy for lighting	133.1010	1.5338	204.1547	(282)
Total Primary energy kWh/year			3898.2283	(286)
Dwelling Primary energy Rate (DPER)			70.6500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.7090	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1421	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3921	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3333	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)

Adj infilt rate													
	0.4250	0.4166	0.4083	0.3666	0.3583	0.3167	0.3167	0.3083	0.3333	0.3583	0.3750	0.3916	(22b)
Effective ac	0.5903	0.5868	0.5834	0.5672	0.5642	0.5501	0.5501	0.5475	0.5556	0.5642	0.5703	0.5767	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.6400	1.1450	13.3282			(27)
Brickwork	65.7900	11.6400	54.1500	0.1800	9.7470			(29a)
Communal Wall	17.1600	2.1500	15.0100	0.1800	2.7018			(29a)
Stairwell Wall	8.8900		8.8900	0.1800	1.6002			(29a)
Terraced Roof	25.4300		25.4300	0.1100	2.7973			(30)
Total net area of external elements Aum(A, m2)			117.2700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3245			(33)
Main dwelling								
Party Wall 1			11.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 207.9538 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	38.0300	0.0700	2.6621	
E16 Corner (normal)	11.4000	0.0900	1.0260	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.0200	0.0452	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000	
E18 Party wall between dwellings	2.8500	0.0600	0.1710	
E25 Staggered party wall between dwellings	5.7000	0.0600	0.3420	
E1 Steel lintel with perforated steel base plate	6.6900	0.0500	0.3345	
E4 Jamb	23.4000	0.0500	1.1700	
E15 Flat roof with parapet	17.6700	0.5600	9.8952	
E5 Ground floor (normal)	42.1100	0.1600	6.7376	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.8706 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 54.1951 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.4101	27.2473	27.0877	26.3381	26.1978	25.5449	25.5449	25.4240	25.7964	26.1978	26.4815	26.7782	(38)
Heat transfer coeff													
	81.6053	81.4425	81.2829	80.5332	80.3930	79.7400	79.7400	79.6191	79.9915	80.3930	80.6767	80.9733	(39)
Average = Sum(39)m / 12 =												80.5325	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4789	1.4759	1.4730	1.4595	1.4569	1.4451	1.4451	1.4429	1.4496	1.4569	1.4621	1.4674	(40)
HLP (average)												1.4595	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)

Hot water usage for mixer showers

55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m													
	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

224.6708	198.7794	211.2272	185.6408	179.9472	162.1236	159.8990	166.2009	167.9899	187.3702	199.3217	222.1905	(62)
-25.1960	-22.2836	-23.3341	-19.3215	-18.0070	-15.4087	-14.4432	-15.3589	-15.9424	-18.7944	-21.2917	-24.7294	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

199.4748	176.4959	187.8932	166.3193	161.9403	146.7149	145.4558	150.8420	152.0474	168.5759	178.0300	197.4611	(64)
									Total per year (kWh/year) = Sum(64)m =		2031.2506	(64)

12Total per year (kWh/year) 2031 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

96.4862	85.7692	92.0162	82.8060	81.6156	74.9865	74.9495	77.0449	76.9371	84.0837	87.3549	95.6615	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	92.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.2264	89.9293	81.2264	83.9340	81.2264	83.9340	81.2264	81.2264	83.9340	81.2264	83.9340	81.2264	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	160.6494	162.3164	158.1156	149.1724	137.8832	127.2730	120.1847	118.5177	122.7186	131.6617	142.9509	153.5611 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132	32.2132 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053 (71)

Water heating gains (Table 5)

	129.6857	127.6328	123.6776	115.0084	109.6984	104.1480	100.7386	103.5550	106.8570	113.0158	121.3262	128.5772 (72)

Total internal gains

	425.2010	433.5180	416.6591	401.7542	382.4475	365.9944	352.7893	353.9386	364.1490	379.5434	401.8506	417.0043 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	4.6700	36.7938	0.6300	0.7000	0.7700	52.5126 (77)
Southwest	6.9700	36.7938	0.6300	0.7000	0.7700	78.3754 (79)

Solar gains	130.8880	222.9507	305.0509	377.9728	423.3610	420.2995	405.2136	371.3519	330.3056	246.4080	156.7737	112.0129 (83)
Total gains	556.0890	656.4686	721.7099	779.7270	805.8085	786.2939	758.0028	725.2905	694.4546	625.9514	558.6243	529.0171 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.0596	39.1377	39.2145	39.5796	39.6486	39.9733	39.9733	40.0340	39.8476	39.6486	39.5092	39.3644	
alpha	3.6040	3.6092	3.6143	3.6386	3.6432	3.6649	3.6649	3.6689	3.6565	3.6432	3.6339	3.6243	
util living area													
	0.9762	0.9571	0.9265	0.8622	0.7543	0.5951	0.4477	0.4837	0.6876	0.8816	0.9585	0.9798	(86)
MIT	19.2816	19.5680	19.9301	20.3643	20.7057	20.9106	20.9757	20.9675	20.8431	20.4016	19.7678	19.2313	(87)
Th 2	19.7034	19.7056	19.7078	19.7180	19.7200	19.7289	19.7289	19.7306	19.7255	19.7200	19.7161	19.7120	(88)
util rest of house													
	0.9698	0.9460	0.9071	0.8257	0.6901	0.4963	0.3254	0.3598	0.5942	0.8419	0.9456	0.9743	(89)
MIT 2	17.7733	18.1320	18.5800	19.1041	19.4804	19.6781	19.7212	19.7191	19.6244	19.1631	18.3951	17.7158	(90)
Living area fraction										fLA = Living area / (4) =		0.4973	(91)
MIT	18.5233	18.8461	19.2513	19.7308	20.0897	20.2910	20.3450	20.3399	20.2304	19.7790	19.0777	18.4694	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5233	18.8461	19.2513	19.7308	20.0897	20.2910	20.3450	20.3399	20.2304	19.7790	19.0777	18.4694	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9620	0.9366	0.8989	0.8261	0.7101	0.5419	0.3860	0.4209	0.6337	0.8441	0.9375	0.9672	(94)
Useful gains	534.9500	614.8378	648.7300	644.1115	572.2200	426.0691	292.5933	305.3029	440.0437	528.3410	523.6988	511.6462	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1160.6975	1135.8010	1036.4656	872.2378	674.4768	453.8006	298.6287	313.6918	490.3810	737.9281	966.3252	1155.4438	(97)
Space heating kWh													
	465.5562	350.0873	288.4752	164.2509	76.0791	0.0000	0.0000	0.0000	0.0000	155.9328	318.6910	478.9854	(98a)
Space heating requirement - total per year (kWh/year)												2298.0580	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	465.5562	350.0873	288.4752	164.2509	76.0791	0.0000	0.0000	0.0000	0.0000	155.9328	318.6910	478.9854	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2298.0580	
Space heating per m2											(98c) / (4) =	41.6466	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	465.5562	350.0873	288.4752	164.2509	76.0791	0.0000	0.0000	0.0000	0.0000	155.9328	318.6910	478.9854	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	504.3946	379.2929	312.5409	177.9533	82.4259	0.0000	0.0000	0.0000	0.0000	168.9413	345.2774	518.9441	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	199.4748	176.4959	187.8932	166.3193	161.9403	146.7149	145.4558	150.8420	152.0474	168.5759	178.0300	197.4611	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8943	85.5655	85.0180	84.0317	82.4717	79.8000	79.8000	79.8000	79.8000	83.8853	85.3500	85.9697	(217)
Fuel for water heating, kWh/month													
	232.2329	206.2699	221.0039	197.9244	196.3586	183.8533	182.2755	189.0251	190.5356	200.9599	208.5882	229.6868	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8772	13.5396	12.1909	8.9316	6.8990	5.6365	6.2935	8.1805	10.6257	13.9415	15.7469	17.3463	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233a)m	-18.9353	-27.6452	-41.1463	-47.9756	-53.2444	-50.2766	-49.6853	-46.1688	-40.2019	-32.3915	-21.1605	-16.2634	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9962	-17.0698	-34.3839	-52.3054	-69.7949	-70.3346	-69.4830	-58.5220	-42.5053	-24.6035	-10.7401	-6.3030	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2489.7703	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2438.7142	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	136.2091	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-909.1366	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4241.5570	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2489.7703	0.2100	522.8518	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2438.7142	0.2100	512.1300	(264)
Space and water heating			1034.9817	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.2091	0.1443	19.6592	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-445.0948	0.1338	-59.5691	
PV Unit electricity exported	-464.0418	0.1255	-58.2521	
Total			-117.8211	(269)
Total CO2, kg/year			948.7491	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.1900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2489.7703	1.1300	2813.4404	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2438.7142	1.1300	2755.7471	(278)
Space and water heating			5569.1875	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.2091	1.5338	208.9220	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-445.0948	1.4946	-665.2329	
PV Unit electricity exported	-464.0418	0.4608	-213.8175	
Total			-879.0505	(283)
Total Primary energy kWh/year			5029.1598	(286)
Target Primary Energy Rate (TPER)			91.1400	(287)

Full SAP Calculation Printout

Plot Reference	P-05	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-05
Plot Address	Flat 5, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.84	**TER**	17.19
Environmental	95 A	**% DER < TER**			60.21
CO_2 Emissions (t/year)	0.31	**DFEE**	45.93	**TFEE**	50.28
Compliance Check	See BREL	**% DFEE < TFEE**			8.64
% DPER < TPER	22.47	**DPER**	70.65	**TPER**	91.12

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.7090	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9500	(17)
Infiltration rate		0.1475	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2999	0.2967	0.2936	0.2779	0.2748	0.2591	0.2591	0.2560	0.2654	0.2748	0.2810	0.2873	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Brickwork	65.7900	13.5900	52.2000	0.2100	10.9620	110.0000	5742.0001	(29a)
Communal Wall	17.1600	2.1500	15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Stairwell Wall	8.8900		8.8900	0.2200	1.9558	110.0000	977.9000	(29a)
Terraced Roof	25.4300		25.4300	0.1300	3.3059	9.0000	228.8700	(30)
Total net area of external elements Aum(A, m2)			117.2700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6670			(33)
Main dwelling								
Party Wall 1			11.2200	0.0000	0.0000	110.0000	1234.2000	(32)
Party Floor 1			55.1800			0.0000	0.0000	(32d)
Party Ceiling 1			28.7500			30.0000	862.5000	(32b)
Internal Wall 1			86.4800			9.0000	778.3200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11474.8902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 207.9538 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.0300	0.0380	1.4451
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.6900	0.0500	0.3345
E4 Jamb	23.4000	0.0160	0.3744
E15 Flat roof with parapet	17.6700	0.3000	5.3010
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.2649 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.9318 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.9234	13.7778	13.6323	12.9046	12.7590	12.0313	12.0313	11.8858	12.3224	12.7590	13.0501	13.3412	(38)
Heat transfer coeff	64.8552	64.7097	64.5641	63.8364	63.6909	62.9632	62.9632	62.8176	63.2542	63.6909	63.9820	64.2730	(39)
Average = Sum(39)m / 12 =												63.8000	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1753	1.1727	1.1701	1.1569	1.1542	1.1411	1.1411	1.1384	1.1463	1.1542	1.1595	1.1648	(40)
HLP (average)												1.1562	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8426 (42)
Hot water usage for mixer showers

55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day) 103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)											Total = Sum(45)m =	1716.7439	
Distribution loss (46)m = 0.15 x (45)m	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
										Total per year (kWh/year) = Sum(64)m =		2034.0749	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8418	16.7351	13.6099	10.3036	7.7021	6.5024	7.0261	9.1328	12.2580	15.5643	18.1658	19.3655	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.7752	242.2633	235.9934	222.6453	205.7958	189.9597	179.3802	176.8921	183.1620	196.5101	213.3596	229.1957	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)
Total internal gains	422.9518	421.2803	407.9299	382.6063	357.8453	335.2591	321.7939	324.2288	336.9260	359.7391	387.5006	411.7874	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(79)

Southeast				5.4500		36.7938		0.3300		0.0000		0.7700	50.9538 (77)
Southwest				2.7200		36.7938		0.3300		0.0000		0.7700	25.4301 (79)
Solar gains	127.0572	216.4254	296.1226	366.9103	410.9701	407.9982	393.3538	360.4832	320.6382	239.1961	152.1852	108.7345 (83)	
Total gains	550.0089	637.7056	704.0525	749.5166	768.8153	743.2572	715.1477	684.7120	657.5642	598.9353	539.6858	520.5219 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.1475	49.2580	49.3691	49.9318	50.0459	50.6244	50.6244	50.7416	50.3914	50.0459	49.8183	49.5926	
alpha	4.2765	4.2839	4.2913	4.3288	4.3364	4.3750	4.3750	4.3828	4.3594	4.3364	4.3212	4.3062	
util living area	0.9721	0.9488	0.9062	0.8244	0.6945	0.5245	0.3836	0.4164	0.6217	0.8511	0.9512	0.9772	(86)
MIT	19.7777	20.0260	20.3348	20.6542	20.8692	20.9705	20.9940	20.9914	20.9380	20.6583	20.1592	19.7242	(87)
Th 2	19.9398	19.9419	19.9440	19.9547	19.9568	19.9674	19.9674	19.9696	19.9632	19.9568	19.9525	19.9483	(88)
util rest of house	0.9652	0.9369	0.8851	0.7871	0.6361	0.4467	0.2955	0.3258	0.5428	0.8106	0.9377	0.9714	(89)
MIT 2	18.5572	18.8663	19.2431	19.6223	19.8509	19.9503	19.9653	19.9663	19.9230	19.6395	19.0450	18.4965	(90)
Living area fraction									fLA = Living area / (4) =			0.4973	(91)
MIT	19.1641	19.4430	19.7860	20.1355	20.3573	20.4576	20.4769	20.4761	20.4277	20.1461	19.5991	19.1070	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1641	19.4430	19.7860	20.1355	20.3573	20.4576	20.4769	20.4761	20.4277	20.1461	19.5991	19.1070	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9589	0.9302	0.8816	0.7940	0.6594	0.4843	0.3393	0.3708	0.5793	0.8187	0.9322	0.9656	(94)
Useful gains	527.4077	593.1982	620.6633	595.1408	506.9594	359.9468	242.6358	253.8861	380.9168	490.3243	503.0955	502.6391	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	964.0162	941.0737	857.7981	717.2317	551.3903	368.8139	244.0987	256.0480	400.2557	608.0009	799.7147	958.1194	(97)
Space heating kWh	324.8367	233.7723	176.4283	87.9054	33.0566	0.0000	0.0000	0.0000	0.0000	87.5514	213.5659	338.8773	(98a)
Space heating requirement - total per year (kWh/year)												1495.9939	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	324.8367	233.7723	176.4283	87.9054	33.0566	0.0000	0.0000	0.0000	0.0000	87.5514	213.5659	338.8773	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1495.9939	
Space heating per m2										(98c) / (4) =		27.1112	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	324.8367	233.7723	176.4283	87.9054	33.0566	0.0000	0.0000	0.0000	0.0000	87.5514	213.5659	338.8773	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	324.8367	233.7723	176.4283	87.9054	33.0566	0.0000	0.0000	0.0000	0.0000	87.5514	213.5659	338.8773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.0017	9.0338	10.0017	9.6791	10.0017	9.6791	10.0017	10.0017	9.6791	10.0017	9.6791	10.0017	(231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1495.9939	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	626.7949	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6860)		
mechanical ventilation fans (SFP = 0.6860)	117.7622	(230a)
Total electricity for the above, kWh/year	117.7622	(231)
Electricity for lighting (calculated in Appendix L)	133.1010	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2373.6520	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1495.9939	16.4900	246.6894	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	16.4900	103.3585	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	117.7622	16.4900	19.4190	(249)
Energy for lighting	133.1010	16.4900	21.9484	(250)
Additional standing charges			0.0000	(251)
Total energy cost			391.4152	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.4066	(257)
SAP value		77.1996	
SAP rating (Section 12)		77	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1495.9939	0.1562	233.6719	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			322.1321	(265)
Pumps, fans and electric keep-hot	117.7622	0.1387	16.3351	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			357.6777	(272)
CO2 emissions per m2			6.4800	(273)
EI value			95.2157	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.7090	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9500 (17)
Infiltration rate		0.1475 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1348	0.1285	0.1285	0.1191	0.1222	0.1066	0.1066	0.1034	0.1066	0.1191	0.1160	0.1254	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2748	0.2685	0.2685	0.2591	0.2622	0.2466	0.2466	0.2434	0.2466	0.2591	0.2560	0.2654	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Brickwork	65.7900	13.5900	52.2000	0.2100	10.9620	110.0000	5742.0001	(29a)
Communal Wall	17.1600	2.1500	15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Stairwell Wall	8.8900		8.8900	0.2200	1.9558	110.0000	977.9000	(29a)
Terraced Roof	25.4300		25.4300	0.1300	3.3059	9.0000	228.8700	(30)
Total net area of external elements Aum(A, m2)			117.2700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6670			(33)
Main dwelling								
Party Wall 1			11.2200	0.0000	0.0000	110.0000	1234.2000	(32)
Party Floor 1			55.1800			0.0000	0.0000	(32d)
Party Ceiling 1			28.7500			30.0000	862.5000	(32b)
Internal Wall 1			86.4800			9.0000	778.3200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11474.8902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	207.9538 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.0300	0.0380	1.4451
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.6900	0.0500	0.3345
E4 Jamb	23.4000	0.0160	0.3744
E15 Flat roof with parapet	17.6700	0.3000	5.3010
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.2649 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.9318 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7590	12.4680	12.4680	12.0313	12.1769	11.4492	11.4492	11.3036	11.4492	12.0313	11.8858	12.3224	(38)
Heat transfer coeff	63.6909	63.3998	63.3998	62.9632	63.1087	62.3810	62.3810	62.2355	62.3810	62.9632	62.8176	63.2542	(39)
Average = Sum(39)m / 12 =												62.9146	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1542	1.1490	1.1490	1.1411	1.1437	1.1305	1.1305	1.1279	1.1305	1.1411	1.1384	1.1463	(40)
HLP (average)												1.1402	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8426 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)

Hot water usage for baths

23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)

Hot water usage for other uses

33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)

Average daily hot water use (litres/day)	103.3574 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	

Distribution loss (46)m = 0.15 x (45)m

26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)

Water storage loss (or HIU loss):

Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
									Total per year (kWh/year) = Sum(64)m =			2034.0749	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.8418	16.7351	13.6099	10.3036	7.7021	6.5024	7.0261	9.1328	12.2580	15.5643	18.1658	19.3655	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	239.7752	242.2633	235.9934	222.6453	205.7958	189.9597	179.3802	176.8921	183.1620	196.5101	213.3596	229.1957	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)													
	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)
Total internal gains													
	422.9518	421.2803	407.9299	382.6063	357.8453	335.2591	321.7939	324.2288	336.9260	359.7391	387.5006	411.7874	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(79)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
Southwest	2.7200	43.0593	0.3300	0.0000	0.7700	29.7605	(79)

Solar gains	148.6931	221.2497	301.0792	380.8523	418.1079	440.3356	419.8178	392.4650	348.1590	262.5340	175.4126	128.0207	(83)
Total gains	571.6449	642.5300	709.0092	763.4586	775.9531	775.5947	741.6116	716.6938	685.0850	622.2731	562.9132	539.8081	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.0459	50.2757	50.2757	50.6244	50.5076	51.0968	51.0968	51.2163	51.0968	50.6244	50.7416	50.3914	
alpha	4.3364	4.3517	4.3517	4.3750	4.3672	4.4065	4.4065	4.4144	4.4065	4.3750	4.3828	4.3594	
util living area													
	0.9617	0.9368	0.8831	0.7763	0.6181	0.4130	0.2769	0.2943	0.5284	0.7975	0.9297	0.9681	(86)
MIT	19.9637	20.1751	20.4709	20.7616	20.9292	20.9908	20.9988	20.9985	20.9723	20.7713	20.3412	19.9166	(87)
Th 2	19.9568	19.9610	19.9610	19.9674	19.9653	19.9760	19.9760	19.9781	19.9760	19.9674	19.9696	19.9632	(88)
util rest of house													
	0.9522	0.9220	0.8571	0.7315	0.5517	0.3340	0.1913	0.2064	0.4454	0.7462	0.9105	0.9600	(89)
MIT 2	18.8023	19.0646	19.4185	19.7501	19.9141	19.9719	19.9758	19.9778	19.9608	19.7693	19.2797	18.7492	(90)
Living area fraction										fLA = Living area / (4) =		0.4973	(91)
MIT	19.3799	19.6168	19.9419	20.2531	20.4189	20.4786	20.4845	20.4854	20.4638	20.2676	19.8076	19.3297	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3799	19.6168	19.9419	20.2531	20.4189	20.4786	20.4845	20.4854	20.4638	20.2676	19.8076	19.3297	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9459	0.9163	0.8566	0.7446	0.5817	0.3731	0.2339	0.2501	0.4857	0.7622	0.9070	0.9539	(94)
Useful gains	540.7014	588.7531	607.3256	568.4706	451.3356	289.3891	173.4789	179.2731	332.7526	474.3025	510.5418	514.9435	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	909.4966	882.3243	795.1511	651.8647	474.5092	291.8549	173.7009	179.5721	340.8388	552.0333	741.7230	900.0918	(97)
Space heating kWh													
	274.3836	197.2799	139.7422	60.0437	17.2411	0.0000	0.0000	0.0000	0.0000	57.8317	166.4504	286.5503	(98a)
Space heating requirement - total per year (kWh/year)												1199.5229	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	274.3836	197.2799	139.7422	60.0437	17.2411	0.0000	0.0000	0.0000	0.0000	57.8317	166.4504	286.5503	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1199.5229	
Space heating per m2											(98c) / (4) =	21.7384	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	274.3836	197.2799	139.7422	60.0437	17.2411	0.0000	0.0000	0.0000	0.0000	57.8317	166.4504	286.5503	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	274.3836	197.2799	139.7422	60.0437	17.2411	0.0000	0.0000	0.0000	0.0000	57.8317	166.4504	286.5503	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.0017	9.0338	10.0017	9.6791	10.0017	9.6791	10.0017	10.0017	9.6791	10.0017	9.6791	10.0017	(231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1199.5229	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.7949	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6860)													
mechanical ventilation fans (SFP = 0.6860)												117.7622	(230a)
Total electricity for the above, kWh/year												117.7622	(231)
Electricity for lighting (calculated in Appendix L)												133.1010	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2077.1810	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1199.5229	27.6700	331.9080	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	27.6700	173.4342	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	117.7622	27.6700	32.5848	(249)
Energy for lighting	133.1010	27.6700	36.8290	(250)
Additional standing charges			0.0000	(251)
Total energy cost			574.7560	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1199.5229	0.1569	188.2388	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			276.6990	(265)
Pumps, fans and electric keep-hot	117.7622	0.1387	16.3351	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			312.2446	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1199.5229	1.5809	1896.3849	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	1.5219	953.8959	(278)

Space and water heating			2850.2808 (279)
Pumps, fans and electric keep-hot	117.7622	1.5128	178.1506 (281)
Energy for lighting	133.1010	1.5338	204.1547 (282)
Total Primary energy kWh/year			3232.5862 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 77
Current environmental impact rating: A 95

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 77
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£575	£575	£0
Space heating	£364	£364	£0
Water heating	£173	£173	£0
Lighting	£37	£37	£0
Total cost of fuels	£575	£575	£0
Total cost of uses	£574	£574	£0
Delivered energy	38 kWh/m²	38 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	59 kWh/m²	59 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b) x	2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.7090	(5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9500 (17)
Infiltration rate		0.1475 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000	(23c)
Effective ac	0.2999	0.2967	0.2936	0.2779	0.2748	0.2591	0.2591	0.2560	0.2654	0.2748	0.2810	0.2873	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Brickwork	65.7900	13.5900	52.2000	0.2100	10.9620	110.0000	5742.0001	(29a)
Communal Wall	17.1600	2.1500	15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Stairwell Wall	8.8900		8.8900	0.2200	1.9558	110.0000	977.9000	(29a)
Terraced Roof	25.4300		25.4300	0.1300	3.3059	9.0000	228.8700	(30)
Total net area of external elements Aum(A, m2)			117.2700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6670			(33)
Main dwelling								
Party Wall 1			11.2200	0.0000	0.0000	110.0000	1234.2000	(32)
Party Floor 1			55.1800			0.0000	0.0000	(32d)
Party Ceiling 1			28.7500			30.0000	862.5000	(32b)
Internal Wall 1			86.4800			9.0000	778.3200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11474.8902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		207.9538 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.0300	0.0380	1.4451
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.9000	0.0500	0.3345
E4 Jamb	23.4000	0.0160	0.3744
E15 Flat roof with parapet	17.6700	0.3000	5.3010
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.2649 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.9318 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.9234	13.7778	13.6323	12.9046	12.7590	12.0313	12.0313	11.8858	12.3224	12.7590	13.0501	13.3412	(38)
Heat transfer coeff	64.8552	64.7097	64.5641	63.8364	63.6909	62.9632	62.9632	62.8176	63.2542	63.6909	63.9820	64.2730	(39)
Average = Sum(39)m / 12 =												63.8000	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1753	1.1727	1.1701	1.1569	1.1542	1.1411	1.1411	1.1384	1.1463	1.1542	1.1595	1.1648	(40)
HLP (average)												1.1562	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8426	(42)
Hot water usage for mixer showers	55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)
Hot water usage for baths	23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)
Hot water usage for other uses	33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)
Average daily hot water use (litres/day)												103.3574	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
										Total per year (kWh/year) = Sum(64)m =		2034.0749	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.8418	16.7351	13.6099	10.3036	7.7021	6.5024	7.0261	9.1328	12.2580	15.5643	18.1658	19.3655	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	239.7752	242.2633	235.9934	222.6453	205.7958	189.9597	179.3802	176.8921	183.1620	196.5101	213.3596	229.1957	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)

Water heating gains (Table 5)

	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)

Total internal gains

	422.9518	421.2803	407.9299	382.6063	357.8453	335.2591	321.7939	324.2288	336.9260	359.7391	387.5006	411.7874	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(79)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Southwest	2.7200	36.7938	0.3300	0.0000	0.7700	25.4301	(79)

Solar gains	127.0572	216.4254	296.1226	366.9103	410.9701	407.9982	393.3538	360.4832	320.6382	239.1961	152.1852	108.7345	(83)
Total gains	550.0089	637.7056	704.0525	749.5166	768.8153	743.2572	715.1477	684.7120	657.5642	598.9353	539.6858	520.5219	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.1475	49.2580	49.3691	49.9318	50.0459	50.6244	50.6244	50.7416	50.3914	50.0459	49.8183	49.5926	
alpha	4.2765	4.2839	4.2913	4.3288	4.3364	4.3750	4.3750	4.3828	4.3594	4.3364	4.3212	4.3062	
util living area	0.9721	0.9488	0.9062	0.8244	0.6945	0.5245	0.3836	0.4164	0.6217	0.8511	0.9512	0.9772	(86)
MIT	19.7777	20.0260	20.3348	20.6542	20.8692	20.9705	20.9940	20.9914	20.9380	20.6583	20.1592	19.7242	(87)
Th 2	19.9398	19.9419	19.9440	19.9547	19.9568	19.9674	19.9674	19.9696	19.9632	19.9568	19.9525	19.9483	(88)
util rest of house	0.9652	0.9369	0.8851	0.7871	0.6361	0.4467	0.2955	0.3258	0.5428	0.8106	0.9377	0.9714	(89)
MIT 2	18.5572	18.8663	19.2431	19.6223	19.8509	19.9503	19.9653	19.9663	19.9230	19.6395	19.0450	18.4965	(90)
Living area fraction									fLA = Living area / (4) =			0.4973	(91)
MIT	19.1641	19.4430	19.7860	20.1355	20.3573	20.4576	20.4769	20.4761	20.4277	20.1461	19.5991	19.1070	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1641	19.4430	19.7860	20.1355	20.3573	20.4576	20.4769	20.4761	20.4277	20.1461	19.5991	19.1070	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9589	0.9302	0.8816	0.7940	0.6594	0.4843	0.3393	0.3708	0.5793	0.8187	0.9322	0.9656	(94)
Useful gains	527.4077	593.1982	620.6633	595.1408	506.9594	359.9468	242.6358	253.8861	380.9168	490.3243	503.0955	502.6391	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	964.0162	941.0737	857.7981	717.2317	551.3903	368.8139	244.0987	256.0480	400.2557	608.0009	799.7147	958.1194	(97)
Space heating kWh	324.8367	233.7723	176.4283	87.9054	33.0566	0.0000	0.0000	0.0000	0.0000	87.5514	213.5659	338.8773	(98a)
Space heating requirement - total per year (kWh/year)												1495.9939	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	324.8367	233.7723	176.4283	87.9054	33.0566	0.0000	0.0000	0.0000	0.0000	87.5514	213.5659	338.8773	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1495.9939	
Space heating per m2											(98c) / (4) =	27.1112	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	324.8367	233.7723	176.4283	87.9054	33.0566	0.0000	0.0000	0.0000	0.0000	87.5514	213.5659	338.8773	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	324.8367	233.7723	176.4283	87.9054	33.0566	0.0000	0.0000	0.0000	0.0000	87.5514	213.5659	338.8773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating
Water heating requirement

	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470 (64)
Efficiency of water heater												324.5200 (216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200 (217)
Fuel for water heating, kWh/month												
	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	10.0017	9.0338	10.0017	9.6791	10.0017	9.6791	10.0017	10.0017	9.6791	10.0017	9.6791	10.0017 (231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1495.9939 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	626.7949 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6860)	
mechanical ventilation fans (SFP = 0.6860)	117.7622 (230a)
Total electricity for the above, kWh/year	117.7622 (231)
Electricity for lighting (calculated in Appendix L)	133.1010 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2373.6520 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1495.9939	16.4900	246.6894	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	16.4900	103.3585	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	117.7622	16.4900	19.4190	(249)
Energy for lighting	133.1010	16.4900	21.9484	(250)
Additional standing charges			0.0000	(251)
Total energy cost			391.4152	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.4066 (257)
SAP value		77.1996
SAP rating (Section 12)		77 (258)
SAP band		C

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1495.9939	0.1562	233.6719	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			322.1321	(265)
Pumps, fans and electric keep-hot	117.7622	0.1387	16.3351	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			357.6777	(272)
CO2 emissions per m2			6.4800	(273)
EI value			95.2157	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1800	(1b)	x 2.5500	(2b) =	140.7090	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.7090	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9500 (17)
Infiltration rate		0.1475 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1348	0.1285	0.1285	0.1191	0.1222	0.1066	0.1066	0.1034	0.1066	0.1191	0.1160	0.1254	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2748	0.2685	0.2685	0.2591	0.2622	0.2466	0.2466	0.2434	0.2466	0.2591	0.2560	0.2654	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window-GBY			8.1700	1.1450	9.3550			(27)
Brickwork	65.7900	13.5900	52.2000	0.2100	10.9620	110.0000	5742.0001	(29a)
Communal Wall	17.1600	2.1500	15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Stairwell Wall	8.8900		8.8900	0.2200	1.9558	110.0000	977.9000	(29a)
Terraced Roof	25.4300		25.4300	0.1300	3.3059	9.0000	228.8700	(30)
Total net area of external elements Aum(A, m2)			117.2700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6670			(33)
Main dwelling								
Party Wall 1			11.2200	0.0000	0.0000	110.0000	1234.2000	(32)
Party Floor 1			55.1800			0.0000	0.0000	(32d)
Party Ceiling 1			28.7500			30.0000	862.5000	(32b)
Internal Wall 1			86.4800			9.0000	778.3200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11474.8902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	207.9538 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.0300	0.0380	1.4451
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.2600	0.3300	0.7458
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.0800	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0380	0.1083
E25 Staggered party wall between dwellings	5.7000	0.0310	0.1767
E1 Steel lintel with perforated steel base plate	6.6900	0.0500	0.3345
E4 Jamb	23.4000	0.0160	0.3744
E15 Flat roof with parapet	17.6700	0.3000	5.3010
E5 Ground floor (normal)	42.1100	0.1120	4.7163

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.2649 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.9318 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.7590	12.4680	12.4680	12.0313	12.1769	11.4492	11.4492	11.3036	11.4492	12.0313	11.8858	12.3224	(38)
Heat transfer coeff	63.6909	63.3998	63.3998	62.9632	63.1087	62.3810	62.3810	62.2355	62.3810	62.9632	62.8176	63.2542	(39)
Average = Sum(39)m / 12 =												62.9146	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1542	1.1490	1.1490	1.1411	1.1437	1.1305	1.1305	1.1279	1.1305	1.1411	1.1384	1.1463	(40)
HLP (average)												1.1402	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8426	(42)
Hot water usage for mixer showers													
	55.1144	54.2861	53.0792	50.7699	49.0658	47.1653	46.0850	47.2828	48.5959	50.6364	52.9953	54.9032	(42a)
Hot water usage for baths													
	23.8242	23.4704	22.9721	22.0535	21.3655	20.6028	20.1907	20.6855	21.2242	22.0404	22.9780	23.7437	(42b)
Hot water usage for other uses													
	33.5004	32.2822	31.0640	29.8458	28.6276	27.4094	27.4094	28.6276	29.8458	31.0640	32.2822	33.5004	(42c)
Average daily hot water use (litres/day)												103.3574	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	112.4390	110.0387	107.1153	102.6692	99.0589	95.1774	93.6852	96.5960	99.6659	103.7408	108.2555	112.1473	(44)
Energy conte	178.0759	156.6937	164.6323	140.5490	133.3523	117.0318	113.3041	119.6060	122.8980	140.7753	154.2298	175.5956	(45)
Energy content (annual)										Total = Sum(45)m =		1716.7439	
Distribution loss (46)m = 0.15 x (45)m													
	26.7114	23.5041	24.6948	21.0823	20.0028	17.5548	16.9956	17.9409	18.4347	21.1163	23.1345	26.3393	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
										Total per year (kWh/year) = Sum(64)m =		2034.0749	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	59.2102	52.1007	54.7402	46.7325	44.3397	38.9131	37.6736	39.7690	40.8636	46.8078	51.2814	58.3855	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	110.5579	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.8418	16.7351	13.6099	10.3036	7.7021	6.5024	7.0261	9.1328	12.2580	15.5643	18.1658	19.3655	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	239.7752	242.2633	235.9934	222.6453	205.7958	189.9597	179.3802	176.8921	183.1620	196.5101	213.3596	229.1957	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	47.8984	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	-73.7053	(71)
Water heating gains (Table 5)													
	79.5837	77.5307	73.5756	64.9063	59.5963	54.0459	50.6366	53.4529	56.7550	62.9137	71.2242	78.4752	(72)
Total internal gains													
	422.9518	421.2803	407.9299	382.6063	357.8453	335.2591	321.7939	324.2288	336.9260	359.7391	387.5006	411.7874	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(79)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
Southwest	2.7200	43.0593	0.3300	0.0000	0.7700	29.7605	(79)

Solar gains	148.6931	221.2497	301.0792	380.8523	418.1079	440.3356	419.8178	392.4650	348.1590	262.5340	175.4126	128.0207	(83)
Total gains	571.6449	642.5300	709.0092	763.4586	775.9531	775.5947	741.6116	716.6938	685.0850	622.2731	562.9132	539.8081	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.0459	50.2757	50.2757	50.6244	50.5076	51.0968	51.0968	51.2163	51.0968	50.6244	50.7416	50.3914	
alpha	4.3364	4.3517	4.3517	4.3750	4.3672	4.4065	4.4065	4.4144	4.4065	4.3750	4.3828	4.3594	
util living area													
	0.9617	0.9368	0.8831	0.7763	0.6181	0.4130	0.2769	0.2943	0.5284	0.7975	0.9297	0.9681	(86)
MIT	19.9637	20.1751	20.4709	20.7616	20.9292	20.9908	20.9988	20.9985	20.9723	20.7713	20.3412	19.9166	(87)
Th 2	19.9568	19.9610	19.9610	19.9674	19.9653	19.9760	19.9760	19.9781	19.9760	19.9674	19.9696	19.9632	(88)
util rest of house													
	0.9522	0.9220	0.8571	0.7315	0.5517	0.3340	0.1913	0.2064	0.4454	0.7462	0.9105	0.9600	(89)
MIT 2	18.8023	19.0646	19.4185	19.7501	19.9141	19.9719	19.9758	19.9778	19.9608	19.7693	19.2797	18.7492	(90)
Living area fraction										fLA = Living area / (4) =		0.4973	(91)
MIT	19.3799	19.6168	19.9419	20.2531	20.4189	20.4786	20.4845	20.4854	20.4638	20.2676	19.8076	19.3297	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3799	19.6168	19.9419	20.2531	20.4189	20.4786	20.4845	20.4854	20.4638	20.2676	19.8076	19.3297	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9459	0.9163	0.8566	0.7446	0.5817	0.3731	0.2339	0.2501	0.4857	0.7622	0.9070	0.9539	(94)
Useful gains	540.7014	588.7531	607.3256	568.4706	451.3356	289.3891	173.4789	179.2731	332.7526	474.3025	510.5418	514.9435	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	909.4966	882.3243	795.1511	651.8647	474.5092	291.8549	173.7009	179.5721	340.8388	552.0333	741.7230	900.0918	(97)
Space heating kWh	274.3836	197.2799	139.7422	60.0437	17.2411	0.0000	0.0000	0.0000	0.0000	57.8317	166.4504	286.5503	(98a)
Space heating requirement - total per year (kWh/year)												1199.5229	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	274.3836	197.2799	139.7422	60.0437	17.2411	0.0000	0.0000	0.0000	0.0000	57.8317	166.4504	286.5503	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1199.5229	
Space heating per m2											(98c) / (4) =	21.7384	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	274.3836	197.2799	139.7422	60.0437	17.2411	0.0000	0.0000	0.0000	0.0000	57.8317	166.4504	286.5503	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	274.3836	197.2799	139.7422	60.0437	17.2411	0.0000	0.0000	0.0000	0.0000	57.8317	166.4504	286.5503	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	205.0273	181.0369	191.5837	166.6310	160.3037	143.1138	140.2555	146.5574	148.9800	167.7267	180.3118	202.5470	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1786	55.7861	59.0360	51.3469	49.3972	44.1001	43.2194	45.1613	45.9078	51.6846	55.5626	62.4143	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.0017	9.0338	10.0017	9.6791	10.0017	9.6791	10.0017	10.0017	9.6791	10.0017	9.6791	10.0017	(231)
Lighting	16.4921	13.2306	11.9127	8.7277	6.7416	5.5079	6.1499	7.9938	10.3832	13.6233	15.3875	16.9505	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1199.5229	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	626.7949	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6860)		
mechanical ventilation fans (SFP = 0.6860)	117.7622	(230a)
Total electricity for the above, kWh/year	117.7622	(231)
Electricity for lighting (calculated in Appendix L)	133.1010	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2077.1810	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1199.5229	27.6700	331.9080	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	27.6700	173.4342	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	117.7622	27.6700	32.5848	(249)
Energy for lighting	133.1010	27.6700	36.8290	(250)

Additional standing charges	0.0000	(251)
Total energy cost	574.7560	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1199.5229	0.1569	188.2388	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.7949	0.1411	88.4602	(264)
Space and water heating			276.6990	(265)
Pumps, fans and electric keep-hot	117.7622	0.1387	16.3351	(267)
Energy for lighting	133.1010	0.1443	19.2106	(268)
Total CO2, kg/year			312.2446	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1199.5229	1.5809	1896.3849	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.7949	1.5219	953.8959	(278)
Space and water heating			2850.2808	(279)
Pumps, fans and electric keep-hot	117.7622	1.5128	178.1506	(281)
Energy for lighting	133.1010	1.5338	204.1547	(282)
Total Primary energy kWh/year			3232.5862	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-06	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-06
Plot Address	Flat 6, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	7.11	**TER**	15.54
Environmental	94 A	**% DER < TER**			54.25
CO_2 Emissions (t/year)	0.5	**DFEE**	50.62	**TFEE**	50.12
Compliance Check	See BREL	**% DFEE < TFEE**			-1.01
% DPER < TPER	11.28	**DPER**	73.12	**TPER**	82.41

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	242.66	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	53.88 m	84.66 m²	2.80 m

8.0 Living Area	25.99	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	98.19	71.45	0.00	None	26.74	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	28.13	25.98	0.50	Stairwell Access Corridor 1	2.15	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	8.98	8.98	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	7.48	7.48	0.50	Stairwell Access Corridor 1	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	147.51

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	84.66	84.66	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Summary for Input Data

elmhurst energy

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	84.66

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.31			1.20
Window-GBY	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	North West	2.15	
Patio Door	Window-Red	Brickwork	North East	6.50	
South	Window-GBY	Brickwork	South East	7.75	
East	Window-Red	Brickwork	North East	4.91	
North	Window-GBY	Brickwork	North West	2.47	
West	Window-GBY	Brickwork	South West	5.11	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging — Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	41.72	0.04	0.04	RCD	No
E18 Party wall between dwellings	Independently assessed	11.40	0.04	0.04	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	2.70	0.33	0.33	AbbeyCalculated	No
E16 Corner (normal)	Gov Approved Scheme	22.81	0.05	0.05	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	40.66	0.06	0.06	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	12.56	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	42.60	0.02	0.02	RCD	Yes
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	9.83	0.10	0.10	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	42.11	0.11	0.11	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	7.95	-0.10	-0.10	RCD	No

Y-value	0.06	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	3
Manufacturer SFP	0.54
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	3
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0

Summary for Input Data

Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.79	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	8
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

Summary for Input Data

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-06	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-06
Plot Address	Flat 6, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	7.11	**TER**	15.54
Environmental	94 A	**% DER < TER**			54.25
CO_2 Emissions (t/year)	0.5	**DFEE**	50.62	**TFEE**	50.12
Compliance Check	See BREL	**% DFEE < TFEE**			-1.01
% DPER < TPER	11.28	**DPER**	73.12	**TPER**	82.41

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	84.6600	(1b)	x 2.8000	(2b) =	237.0480	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	237.0480	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7900 (17)
Infiltration rate		0.1395 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1186 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		71.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2952	0.2922	0.2893	0.2744	0.2715	0.2566	0.2566	0.2537	0.2626	0.2715	0.2774	0.2833	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			15.3300	1.1450	17.5534			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Brickwork	98.1900	26.7400	71.4500	0.2100	15.0045	110.0000	7859.5003	(29a)
Communal Wall	28.1300	2.1500	25.9800	0.2200	5.7156	110.0000	2857.7999	(29a)
Lift Shaft Wall	8.9800		8.9800	0.1600	1.4368	110.0000	987.7999	(29a)
Stairwell Wall	7.4800		7.4800	0.2200	1.6456	110.0000	822.8000	(29a)
Cold Roof	84.6600		84.6600	0.0900	7.6194	9.0000	761.9400	(30)
Total net area of external elements Aum(A, m2)			227.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.6551			(33)
Main dwelling								
Party Floor 1			84.6600			70.0000	5926.2000	(32d)
Internal Wall 1			147.5100			9.0000	1327.5900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20543.6301 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.6604 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.7200	0.0380	1.5854
E18 Party wall between dwellings	11.4000	0.0380	0.4332
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E16 Corner (normal)	22.8100	0.0540	1.2317
E10 Eaves (insulation at ceiling level)	40.6600	0.0630	2.5616
E2 Other lintels (including other steel lintels)	12.5600	0.0500	0.6280
E4 Jamb	42.6000	0.0160	0.6816
E12 Gable (insulation at ceiling level)	9.8300	0.0980	0.9633
E5 Ground floor (normal)	42.1100	0.1120	4.7163
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.9210 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 78.5761 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.0909	22.8591	22.6272	21.4677	21.2358	20.0764	20.0764	19.8445	20.5402	21.2358	21.6996	22.1634	(38)
Heat transfer coeff	101.6671	101.4352	101.2033	100.0438	99.8120	98.6525	98.6525	98.4206	99.1163	99.8120	100.2757	100.7395	(39)

Average = Sum(39)m / 12 = 99.9859

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2009	1.1981	1.1954	1.1817	1.1790	1.1653	1.1653	1.1625	1.1708	1.1790	1.1845	1.1899	(40)
HLP (average)												1.1810	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5454 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	66.8971	65.8917	64.4268	61.6238	59.5553	57.2485	55.9374	57.3912	58.9850	61.4617	64.3249	66.6407	(42a)
Hot water usage for baths	28.8911	28.4621	27.8578	26.7438	25.9095	24.9845	24.4849	25.0849	25.7382	26.7280	27.8650	28.7935	(42b)
Hot water usage for other uses	40.6970	39.2171	37.7373	36.2574	34.7775	33.2976	33.2976	34.7775	36.2574	37.7373	39.2171	40.6970	(42c)

Average daily hot water use (litres/day) 125.4608 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	136.4852	133.5709	130.0219	124.6249	120.2423	115.5306	113.7198	117.2536	120.9805	125.9270	131.4070	136.1313	(44)
Energy conte	216.1593	190.2032	199.8388	170.6053	161.8693	142.0584	137.5343	145.1844	149.1810	170.8817	187.2134	213.1487	(45)

Energy content (annual) Total = Sum(45)m = 2083.8778

Distribution loss (46)m = 0.15 x (45)m

	32.4239	28.5305	29.9758	25.5908	24.2804	21.3088	20.6301	21.7777	22.3772	25.6323	28.0820	31.9723	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(64)

Total per year (kWh/year) = Sum(64)m = 2401.2088 (64)

12Total per year (kWh/year) 2401 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	71.8730	63.2426	66.4464	56.7263	53.8215	47.2344	45.7301	48.2738	49.6027	56.8182	62.2485	70.8719	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.4557	127.8260	115.4557	119.3043	115.4557	119.3043	115.4557	115.4557	119.3043	115.4557	119.3043	115.4557	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.9039	231.2792	225.2935	212.5507	196.4652	181.3470	171.2472	168.8719	174.8576	187.6004	203.6859	218.8041	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	(71)
Water heating gains (Table 5)	96.6034	94.1110	89.3097	78.7865	72.3408	65.6034	61.4652	64.8842	68.8926	76.3685	86.4562	95.2580	(72)
Total internal gains	502.1435	514.3966	491.2393	471.8218	445.4421	427.4350	409.3486	410.3922	424.2349	440.6050	470.6268	490.6982	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.7500	36.7938	0.3300	0.0000	0.7700	72.4572	(77)
Southwest	5.1100	36.7938	0.3300	0.0000	0.7700	47.7750	(79)

Northwest			2.4700		11.2829		0.3300		0.0000		0.7700		7.0815 (81)
Northeast			11.4100		11.2829		0.3100		0.0000		0.7700		30.7298 (75)
Solar gains	158.0435	281.7659	418.8844	574.9346	695.0126	712.4365	677.5222	584.5064	472.3843	320.4061	191.5869	133.7723	(83)
Total gains	660.1870	796.1625	910.1238	1046.7564	1140.4547	1139.8715	1086.8708	994.8986	896.6192	761.0111	662.2137	624.4705	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.1299	56.2582	56.3871	57.0406	57.1731	57.8451	57.8451	57.9814	57.5744	57.1731	56.9087	56.6467	
alpha	4.7420	4.7505	4.7591	4.8027	4.8115	4.8563	4.8563	4.8654	4.8383	4.8115	4.7939	4.7764	
util living area	0.9930	0.9828	0.9582	0.8819	0.7333	0.5394	0.3966	0.4496	0.7013	0.9283	0.9850	0.9946	(86)
MIT	19.6616	19.9072	20.2347	20.6296	20.8815	20.9787	20.9961	20.9930	20.9288	20.5724	20.0449	19.6215	(87)
Th 2	19.9193	19.9215	19.9237	19.9347	19.9369	19.9479	19.9479	19.9501	19.9435	19.9369	19.9325	19.9281	(88)
util rest of house	0.9908	0.9776	0.9455	0.8489	0.6719	0.4569	0.3032	0.3498	0.6160	0.9000	0.9795	0.9929	(89)
MIT 2	18.3806	18.6927	19.1023	19.5786	19.8445	19.9366	19.9467	19.9478	19.8990	19.5282	18.8777	18.3357	(90)
Living area fraction									fLA = Living area / (4) =			0.3070	(91)
MIT	18.7739	19.0655	19.4500	19.9012	20.1628	20.2565	20.2689	20.2686	20.2151	19.8488	19.2360	18.7304	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7739	19.0655	19.4500	19.9012	20.1628	20.2565	20.2689	20.2686	20.2151	19.8488	19.2360	18.7304	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9876	0.9721	0.9386	0.8477	0.6858	0.4816	0.3319	0.3805	0.6393	0.8972	0.9746	0.9901	(94)
Useful gains	651.9684	773.9331	854.2445	887.3842	782.0832	549.0160	360.7818	378.5510	573.2343	682.7712	645.3916	618.3044	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1471.5144	1436.8811	1310.5781	1100.6052	844.6897	558.0286	361.9415	380.7547	606.1105	923.1372	1216.9487	1463.7904	(97)
Space heating kWh	609.7423	445.5011	339.5122	153.5191	46.5793	0.0000	0.0000	0.0000	0.0000	178.8323	411.5211	629.0416	(98a)
Space heating requirement - total per year (kWh/year)												2814.2488	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	609.7423	445.5011	339.5122	153.5191	46.5793	0.0000	0.0000	0.0000	0.0000	178.8323	411.5211	629.0416	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2814.2488	
Space heating per m2											(98c) / (4) =	33.2418	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	609.7423	445.5011	339.5122	153.5191	46.5793	0.0000	0.0000	0.0000	0.0000	178.8323	411.5211	629.0416	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	609.7423	445.5011	339.5122	153.5191	46.5793	0.0000	0.0000	0.0000	0.0000	178.8323	411.5211	629.0416	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	74.9139	66.1119	69.8848	60.6087	58.1846	51.8120	50.6858	53.0432	54.0069	60.9618	65.7264	73.9862	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	18.5689	16.7719	18.5689	17.9699	18.5689	17.9699	18.5689	18.5689	17.9699	18.5689	17.9699	18.5689	(231)
Lighting	23.4991	18.8518	16.9740	12.4359	9.6058	7.8480	8.7628	11.3902	14.7947	19.4114	21.9252	24.1522	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2814.2488	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	739.9263	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	218.6341	(230a)
Total electricity for the above, kWh/year	218.6341	(231)
Electricity for lighting (calculated in Appendix L)	189.6511	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3962.4604	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2814.2488	0.1562	439.7099	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	739.9263	0.1412	104.4772	(264)
Space and water heating			544.1870	(265)
Pumps, fans and electric keep-hot	218.6341	0.1387	30.3272	(267)
Energy for lighting	189.6511	0.1443	27.3725	(268)
Total CO2, kg/year			601.8868	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.1100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2814.2488	1.5784	4442.0893	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	739.9263	1.5221	1126.2559	(278)
Space and water heating			5568.3452	(279)
Pumps, fans and electric keep-hot	218.6341	1.5128	330.7497	(281)
Energy for lighting	189.6511	1.5338	290.8932	(282)
Total Primary energy kWh/year			6189.9881	(286)
Dwelling Primary energy Rate (DPER)			73.1200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	84.6600	(1b) x	2.8000	(2b) =	237.0480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		237.0480	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1266	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3766	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3201	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4081	0.4001	0.3921	0.3521	0.3441	0.3041	0.3041	0.2961	0.3201	0.3441	0.3601	0.3761	(22b)
Effective ac	0.5833	0.5800	0.5769	0.5620	0.5592	0.5462	0.5462	0.5438	0.5512	0.5592	0.5648	0.5707	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.0100	1.1450	21.7672			(27)
Brickwork	98.1900	19.0100	79.1800	0.1800	14.2524			(29a)
Communal Wall	28.1300	2.1500	25.9800	0.1800	4.6764			(29a)
Lift Shaft Wall	8.9800		8.9800	0.1800	1.6164			(29a)
Stairwell Wall	7.4800		7.4800	0.1800	1.3464			(29a)
Cold Roof	84.6600		84.6600	0.1100	9.3126			(30)
Total net area of external elements Aum(A, m2)			227.4400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.1214			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		242.6604 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	41.7200	0.0700	2.9204
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.0200	0.0540
E16 Corner (normal)	22.8100	0.0900	2.0529
E10 Eaves (insulation at ceiling level)	40.6600	0.0600	2.4396
E2 Other lintels (including other steel lintels)	12.5600	0.0500	0.6280
E4 Jamb	42.6000	0.0500	2.1300
E12 Gable (insulation at ceiling level)	9.8300	0.0600	0.5898
E5 Ground floor (normal)	42.1100	0.1600	6.7376
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0900	-0.7155

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.5208 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	72.6422 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.6268	45.3738	45.1259	43.9614	43.7435	42.7292	42.7292	42.5414	43.1199	43.7435	44.1843	44.6451	(38)
Heat transfer coeff	118.2690	118.0160	117.7681	116.6036	116.3857	115.3714	115.3714	115.1836	115.7621	116.3857	116.8264	117.2873	(39)
Average = Sum(39)m / 12 =												116.6025	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3970	1.3940	1.3911	1.3773	1.3747	1.3628	1.3628	1.3605	1.3674	1.3747	1.3799	1.3854	(40)
HLP (average)												1.3773	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5454 (42)

Hot water usage for mixer showers

66.8971	65.8917	64.4268	61.6238	59.5553	57.2485	55.9374	57.3912	58.9850	61.4617	64.3249	66.6407	(42a)

Hot water usage for baths

28.8911	28.4621	27.8578	26.7438	25.9095	24.9845	24.4849	25.0849	25.7382	26.7280	27.8650	28.7935	(42b)

Hot water usage for other uses

40.6970	39.2171	37.7373	36.2574	34.7775	33.2976	33.2976	34.7775	36.2574	37.7373	39.2171	40.6970	(42c)

Average daily hot water use (litres/day)		125.4608 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	136.4852	133.5709	130.0219	124.6249	120.2423	115.5306	113.7198	117.2536	120.9805	125.9270	131.4070	136.1313	(44)
Energy conte	216.1593	190.2032	199.8388	170.6053	161.8693	142.0584	137.5343	145.1844	149.1810	170.8817	187.2134	213.1487	(45)
Energy content (annual)										Total = Sum(45)m =		2083.8778	
Distribution loss (46)m = 0.15 x (45)m	32.4239	28.5305	29.9758	25.5908	24.2804	21.3088	20.6301	21.7777	22.3772	25.6323	28.0820	31.9723	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	262.7542	232.2890	246.4337	215.6971	208.4642	187.1502	184.1292	191.7793	194.2729	217.4766	232.3053	259.7436	(62)
WWHRS	-30.5825	-27.0475	-28.3225	-23.4522	-21.8566	-18.7028	-17.5309	-18.6424	-19.3507	-22.8123	-25.8436	-30.0162	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1716	205.2415	218.1111	192.2450	186.6076	168.4474	166.5982	173.1370	174.9222	194.6643	206.4617	229.7274	(64)
									Total per year (kWh/year) = Sum(64)m =			2348.3350	(64)
12Total per year (kWh/year)												2348	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.1489	96.9112	103.7223	92.7997	91.0975	83.3079	83.0061	85.5497	85.6762	94.0941	98.3219	108.1479	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.4423	127.8111	115.4423	119.2904	115.4423	119.2904	115.4423	115.4423	119.2904	115.4423	119.2904	115.4423	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.9039	231.2792	225.2935	212.5507	196.4652	181.3470	171.2472	168.8719	174.8576	187.6004	203.6859	218.8041	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	(71)
Water heating gains (Table 5)													
	146.7055	144.2130	139.4117	128.8885	122.4428	115.7054	111.5673	114.9862	118.9947	126.4705	136.5582	145.3600	(72)
Total internal gains													
	555.2321	567.4838	544.3279	524.9100	498.5307	477.5232	459.4371	460.4808	474.3230	493.6936	523.7149	543.7868	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.1100	11.2829	0.6300	0.7000	0.7700	27.9650	(75)
Southeast	5.5100	36.7938	0.6300	0.7000	0.7700	61.9582	(77)
Southwest	3.6300	36.7938	0.6300	0.7000	0.7700	40.8182	(79)
Northwest	1.7600	11.2829	0.6300	0.7000	0.7700	6.0689	(81)

Solar gains	136.8102	244.3430	364.3480	501.7751	607.9691	623.7796	592.9809	510.6661	411.4527	278.1472	165.9258	115.7489	(83)
Total gains	692.0423	811.8268	908.6760	1026.6851	1106.4997	1101.3028	1052.4180	971.1469	885.7756	771.8408	689.6407	659.5357	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.2507	48.3541	48.4559	48.9399	49.0315	49.4625	49.4625	49.5432	49.2956	49.0315	48.8465	48.6546	
alpha	4.2167	4.2236	4.2304	4.2627	4.2688	4.2975	4.2975	4.3029	4.2864	4.2688	4.2564	4.2436	
util living area													
	0.9922	0.9840	0.9663	0.9135	0.8012	0.6254	0.4712	0.5265	0.7667	0.9414	0.9848	0.9936	(86)
MIT	19.4033	19.6346	19.9709	20.4118	20.7563	20.9381	20.9854	20.9769	20.8510	20.3981	19.8257	19.3669	(87)
Th 2	19.7656	19.7679	19.7702	19.7808	19.7828	19.7920	19.7920	19.7937	19.7884	19.7828	19.7787	19.7746	(88)
util rest of house													
	0.9896	0.9789	0.9551	0.8848	0.7393	0.5250	0.3474	0.3977	0.6758	0.9156	0.9790	0.9915	(89)
MIT 2	17.9461	18.2406	18.6641	19.2058	19.5870	19.7588	19.7878	19.7862	19.6927	19.2047	18.4931	17.9058	(90)
Living area fraction									fLA = Living area / (4) =			0.3070	(91)
MIT	18.3935	18.6686	19.0652	19.5760	19.9459	20.1208	20.1554	20.1517	20.0483	19.5711	18.9022	18.3543	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3935	18.6686	19.0652	19.5760	19.9459	20.1208	20.1554	20.1517	20.0483	19.5711	18.9022	18.3543	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9855	0.9726	0.9468	0.8790	0.7485	0.5538	0.3856	0.4373	0.6975	0.9099	0.9731	0.9879	(94)
Useful gains	681.9997	789.5606	860.3413	902.4929	828.2657	609.9275	405.8021	424.6794	617.7983	702.2618	671.0926	651.5646	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1666.8191	1624.9148	1479.7848	1244.8623	959.7091	636.9448	410.1968	432.1396	688.5835	1044.1046	1378.8066	1660.1245	(97)
Space heating kWh													
	732.7056	561.3581	460.8660	246.5060	97.7939	0.0000	0.0000	0.0000	0.0000	254.3311	509.5541	750.3686	(98a)
Space heating requirement - total per year (kWh/year)												3613.4833	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	732.7056	561.3581	460.8660	246.5060	97.7939	0.0000	0.0000	0.0000	0.0000	254.3311	509.5541	750.3686	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3613.4833	
Space heating per m2											(98c) / (4) =	42.6823	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	732.7056	561.3581	460.8660	246.5060	97.7939	0.0000	0.0000	0.0000	0.0000	254.3311	509.5541	750.3686	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	793.8306	608.1886	499.3131	267.0704	105.9522	0.0000	0.0000	0.0000	0.0000	275.5483	552.0630	812.9670	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	232.1716	205.2415	218.1111	192.2450	186.6076	168.4474	166.5982	173.1370	174.9222	194.6643	206.4617	229.7274	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4538	86.1973	85.6953	84.6184	82.6815	79.8000	79.8000	79.8000	79.8000	84.6603	86.0031	86.5130	(217)
Fuel for water heating, kWh/month													
	268.5499	238.1068	254.5193	227.1905	225.6945	211.0870	208.7697	216.9636	219.2008	229.9356	240.0630	265.5408	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.9866	19.2430	17.3262	12.6939	9.8051	8.0109	8.9446	11.6265	15.1016	19.8142	22.3801	24.6533	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-22.4980	-33.2333	-50.0227	-58.9786	-65.9849	-62.4511	-61.6749	-57.0313	-49.2697	-39.1842	-25.2618	-19.2772	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-8.4917	-18.2198	-36.8890	-56.4137	-75.5951	-76.3348	-75.4507	-63.4352	-45.9006	-26.3993	-11.4458	-6.6898 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3914.9332	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2805.6214	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	193.5858	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1046.1332	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5954.0072	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3914.9332	0.2100	822.1360	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2805.6214	0.2100	589.1805	(264)
Space and water heating			1411.3165	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	193.5858	0.1443	27.9404	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-544.8676	0.1336	-72.8061	
PV Unit electricity exported	-501.2656	0.1254	-62.8416	
Total			-135.6477	(269)
Total CO2, kg/year			1315.5384	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3914.9332	1.1300	4423.8745	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2805.6214	1.1300	3170.3522	(278)
Space and water heating			7594.2267	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	193.5858	1.5338	296.9284	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-544.8676	1.4938	-813.9169	
PV Unit electricity exported	-501.2656	0.4602	-230.6590	
Total			-1044.5759	(283)
Total Primary energy kWh/year			6976.6799	(286)
Target Primary Energy Rate (TPER)			82.4100	(287)

Full SAP Calculation Printout

Plot Reference	P-06	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-06
Plot Address	Flat 6, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	7.11	**TER**	15.54
Environmental	94 A	**% DER < TER**			54.25
CO_2 Emissions (t/year)	0.5	**DFEE**	50.62	**TFEE**	50.12
Compliance Check	See BREL	**% DFEE < TFEE**			-1.01
% DPER < TPER	11.28	**DPER**	73.12	**TPER**	82.41

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	84.6600 (1b)	x	2.8000 (2b)	=	237.0480	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.0480	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1266	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7900	(17)
Infiltration rate		0.2661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2261	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2883	0.2827	0.2770	0.2488	0.2431	0.2148	0.2148	0.2092	0.2261	0.2431	0.2544	0.2657	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)
Effective ac 0.5416 0.5400 0.5384 0.5309 0.5296 0.5231 0.5231 0.5219 0.5256 0.5296 0.5324 0.5353	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			15.3300	1.1450	17.5534			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Brickwork	98.1900	26.7400	71.4500	0.2100	15.0045	110.0000	7859.5003	(29a)
Communal Wall	28.1300	2.1500	25.9800	0.2200	5.7156	110.0000	2857.7999	(29a)
Lift Shaft Wall	8.9800		8.9800	0.1600	1.4368	110.0000	987.7999	(29a)
Stairwell Wall	7.4800		7.4800	0.2200	1.6456	110.0000	822.8000	(29a)
Cold Roof	84.6600		84.6600	0.0900	7.6194	9.0000	761.9400	(30)
Total net area of external elements Aum(A, m2)			227.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.6551			(33)
Main dwelling								
Party Floor 1			84.6600			70.0000	5926.2000	(32d)
Internal Wall 1			147.5100			9.0000	1327.5900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	20543.6301 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.6604 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	41.7200	0.0380	1.5854	
E18 Party wall between dwellings	11.4000	0.0380	0.4332	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910	
E16 Corner (normal)	22.8100	0.0540	1.2317	
E10 Eaves (insulation at ceiling level)	40.6600	0.0630	2.5616	
E2 Other lintels (including other steel lintels)	12.5600	0.0500	0.6280	
E4 Jamb	42.6000	0.0160	0.6816	
E12 Gable (insulation at ceiling level)	9.8300	0.0980	0.9633	
E5 Ground floor (normal)	42.1100	0.1120	4.7163	
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.9210 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 78.5761 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.3647	42.2385	42.1147	41.5333	41.4246	40.9182	40.9182	40.8245	41.1133	41.4246	41.6446	41.8747	(38)

Heat transfer coeff

	120.9409	120.8146	120.6908	120.1095	120.0007	119.4944	119.4944	119.4006	119.6894	120.0007	120.2208	120.4508	(39)

Average = Sum(39)m / 12 = 120.1090

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4285	1.4271	1.4256	1.4187	1.4174	1.4115	1.4115	1.4104	1.4138	1.4174	1.4200	1.4228	(40)
HLP (average)												1.4187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5454 (42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	28.8911	28.4621	27.8578	26.7438	25.9095	24.9845	24.4849	25.0849	25.7382	26.7280	27.8650	28.7935	(42b)

Hot water usage for other uses

	40.6970	39.2171	37.7373	36.2574	34.7775	33.2976	33.2976	34.7775	36.2574	37.7373	39.2171	40.6970	(42c)

Average daily hot water use (litres/day) 63.7840 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	69.5882	67.6792	65.5951	63.0011	60.6870	58.2821	57.7825	59.8624	61.9955	64.4652	67.0821	69.4905	(44)
Energy conte	110.2107	96.3743	100.8172	86.2454	81.6964	71.6647	69.8829	74.1221	76.4467	87.4787	95.5708	108.8054	(45)

Energy content (annual) Total = Sum(45)m = 1059.3152

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	93.6791	81.9182	85.6946	73.3086	69.4419	60.9150	59.4005	63.0038	64.9797	74.3569	81.2352	92.4845	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	93.6791	81.9182	85.6946	73.3086	69.4419	60.9150	59.4005	63.0038	64.9797	74.3569	81.2352	92.4845	(64)

Total per year (kWh/year) = Sum(64)m = 900.4179 (64)

12Total per year (kWh/year) 900 (64)

Electric shower(s)

	53.5734	47.7343	52.1241	49.7414	50.6747	48.3388	49.9501	50.6747	49.7414	52.1241	51.1439	53.5734	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 609.3942 (64a)

Heat gains from water heating, kWh/month

	36.8131	32.4131	34.4547	30.7625	30.0292	27.3134	27.3376	28.4196	28.6803	31.6202	33.0948	36.5145	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	115.4557	127.8260	115.4557	119.3043	115.4557	119.3043	115.4557	115.4557	119.3043	115.4557	119.3043	115.4557	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	228.9039	231.2792	225.2935	212.5507	196.4652	181.3470	171.2472	168.8719	174.8576	187.6004	203.6859	218.8041	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	(71)

Water heating gains (Table 5)

	49.4800	48.2338	46.3101	42.7257	40.3618	37.9353	36.7441	38.1984	39.8337	42.5003	45.9650	49.0786	(72)

Total internal gains

	455.0201	468.5195	448.2397	435.7610	413.4631	399.7670	384.6274	383.7064	395.1759	406.7369	430.1356	444.5188	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.7500	36.7938	0.3300	0.0000	0.7700	72.4572	(77)
Southwest	5.1100	36.7938	0.3300	0.0000	0.7700	47.7750	(79)
Northwest	2.4700	11.2829	0.3300	0.0000	0.7700	7.0815	(81)
Northeast	11.4100	11.2829	0.3100	0.0000	0.7700	30.7298	(75)

Solar gains	158.0435	281.7659	418.8844	574.9346	695.0126	712.4365	677.5222	584.5064	472.3843	320.4061	191.5869	133.7723	(83)
Total gains	613.0636	750.2854	867.1242	1010.6956	1108.4757	1112.2035	1062.1496	968.2129	867.5602	727.1429	621.7224	578.2911	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.1847	47.2341	47.2825	47.5114	47.5544	47.7559	47.7559	47.7934	47.6781	47.5544	47.4674	47.3767	
alpha	4.1456	4.1489	4.1522	4.1674	4.1703	4.1837	4.1837	4.1862	4.1785	4.1703	4.1645	4.1584	
util living area	0.9950	0.9881	0.9719	0.9209	0.8093	0.6353	0.4815	0.5431	0.7865	0.9533	0.9897	0.9961	(86)
MIT	19.2628	19.5162	19.8814	20.3549	20.7297	20.9281	20.9822	20.9711	20.8227	20.3149	19.6971	19.2144	(87)
Th 2	19.7415	19.7427	19.7438	19.7490	19.7500	19.7546	19.7546	19.7554	19.7528	19.7500	19.7480	19.7459	(88)
util rest of house	0.9933	0.9842	0.9623	0.8935	0.7475	0.5319	0.3519	0.4077	0.6960	0.9313	0.9856	0.9948	(89)
MIT 2	18.1906	18.4425	18.8018	19.2553	19.5803	19.7245	19.7506	19.7481	19.6629	19.2304	18.6277	18.1457	(90)
Living area fraction									fLA = Living area / (4) =			0.3070	(91)
MIT	18.5198	18.7721	19.1333	19.5928	19.9332	20.0940	20.1287	20.1236	20.0189	19.5633	18.9560	18.4738	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5198	18.7721	19.1333	19.5928	19.9332	20.0940	20.1287	20.1236	20.0189	19.5633	18.9560	18.4738	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9800	0.9562	0.8894	0.7576	0.5618	0.3919	0.4495	0.7177	0.9271	0.9819	0.9928	(94)
Useful gains	607.5538	735.2790	829.1488	898.9614	839.7734	624.7977	416.2852	435.1807	622.6835	674.1081	610.4970	574.1428	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1719.7556	1675.9550	1524.7181	1284.3099	987.9842	656.4988	421.6593	444.5947	708.4330	1075.6054	1425.3321	1719.2874	(97)
Space heating kWh	827.4781	632.1343	517.5036	277.4509	110.2688	0.0000	0.0000	0.0000	0.0000	298.7140	586.6813	851.9876	(98a)
Space heating requirement - total per year (kWh/year)												4102.2185	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	827.4781	632.1343	517.5036	277.4509	110.2688	0.0000	0.0000	0.0000	0.0000	298.7140	586.6813	851.9876	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4102.2185	
Space heating per m2										(98c) / (4) =		48.4552	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1123.2471	884.2584	907.4446	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8491	0.9075	0.8737	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	953.7313	802.4279	792.7916	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1255.1472	1198.8862	1091.3484	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	217.0194	294.9650	222.1263	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	54.2548	73.7412	55.5316	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												183.5276	(107)
Energy for space heating												48.4552	(99)
Energy for space cooling												2.1678	(108)
Total												50.6230	(109)
Fabric Energy Efficiency (DFEE)												50.6	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	84.6600	(1b)	x 2.8000	(2b) =	237.0480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		237.0480	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1266	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3766	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3201	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4081	0.4001	0.3921	0.3521	0.3441	0.3041	0.3041	0.2961	0.3201	0.3441	0.3601	0.3761	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5707	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.0100	1.1450	21.7672			(27)
Brickwork	98.1900	19.0100	79.1800	0.1800	14.2524			(29a)
Communal Wall	28.1300	2.1500	25.9800	0.1800	4.6764			(29a)
Lift Shaft Wall	8.9800		8.9800	0.1800	1.6164			(29a)
Stairwell Wall	7.4800		7.4800	0.1800	1.3464			(29a)
Cold Roof	84.6600		84.6600	0.1100	9.3126			(30)
Total net area of external elements Aum(A, m2)			227.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		55.1214			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.6604	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.7200	0.0700	2.9204
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.0200	0.0540
E16 Corner (normal)	22.8100	0.0900	2.0529
E10 Eaves (insulation at ceiling level)	40.6600	0.0600	2.4396
E2 Other lintels (including other steel lintels)	12.5600	0.0500	0.6280
E4 Jamb	42.6000	0.0500	2.1300
E12 Gable (insulation at ceiling level)	9.8300	0.0600	0.5898
E5 Ground floor (normal)	42.1100	0.1600	6.7376
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0900	-0.7155

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.5208	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	72.6422	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.6268	45.3738	45.1259	43.9614	43.7435	42.7292	42.7292	42.5414	43.1199	43.7435	44.1843	44.6451	(38)
Heat transfer coeff	118.2690	118.0160	117.7681	116.6036	116.3857	115.3714	115.3714	115.1836	115.7621	116.3857	116.8264	117.2873	(39)
Average = Sum(39)m / 12 =												116.6025	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3970	1.3940	1.3911	1.3773	1.3747	1.3628	1.3628	1.3605	1.3674	1.3747	1.3799	1.3854	(40)
HLP (average)												1.3773	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5454	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	28.8911	28.4621	27.8578	26.7438	25.9095	24.9845	24.4849	25.0849	25.7382	26.7280	27.8650	28.7935	(42b)

Hot water usage for other uses

	40.6970	39.2171	37.7373	36.2574	34.7775	33.2976	33.2976	34.7775	36.2574	37.7373	39.2171	40.6970	(42c)

Average daily hot water use (litres/day)	63.7840	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	69.5882	67.6792	65.5951	63.0011	60.6870	58.2821	57.7825	59.8624	61.9955	64.4652	67.0821	69.4905	(44)
Energy conte	110.2107	96.3743	100.8172	86.2454	81.6964	71.6647	69.8829	74.1221	76.4467	87.4787	95.5708	108.8054	(45)

Energy content (annual) Total = Sum(45)m =	1059.3152	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	93.6791	81.9182	85.6946	73.3086	69.4419	60.9150	59.4005	63.0038	64.9797	74.3569	81.2352	92.4845	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	93.6791	81.9182	85.6946	73.3086	69.4419	60.9150	59.4005	63.0038	64.9797	74.3569	81.2352	92.4845	(64)

Total per year (kWh/year) = Sum(64)m =	900.4179	(64)
12Total per year (kWh/year)	900	(64)

Electric shower(s)

	53.5734	47.7343	52.1241	49.7414	50.6747	48.3388	49.9501	50.6747	49.7414	52.1241	51.1439	53.5734	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	609.3942	(64a)

Heat gains from water heating, kWh/month

	36.8131	32.4131	34.4547	30.7625	30.0292	27.3134	27.3376	28.4196	28.6803	31.6202	33.0948	36.5145 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	115.4423	127.8111	115.4423	119.2904	115.4423	119.2904	115.4423	115.4423	119.2904	115.4423	119.2904	115.4423	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	228.9039	231.2792	225.2935	212.5507	196.4652	181.3470	171.2472	168.8719	174.8576	187.6004	203.6859	218.8041	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	(71)

Water heating gains (Table 5)

	49.4800	48.2338	46.3101	42.7257	40.3618	37.9353	36.7441	38.1984	39.8337	42.5003	45.9650	49.0786	(72)

Total internal gains

	455.0066	468.5045	448.2263	435.7471	413.4496	399.7531	384.6140	383.6930	395.1620	406.7234	430.1217	444.5054	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.1100	11.2829	0.6300	0.7000	0.7700	27.9650	(75)
Southeast	5.5100	36.7938	0.6300	0.7000	0.7700	61.9582	(77)
Southwest	3.6300	36.7938	0.6300	0.7000	0.7700	40.8182	(79)
Northwest	1.7600	11.2829	0.6300	0.7000	0.7700	6.0689	(81)

Solar gains	136.8102	244.3430	364.3480	501.7751	607.9691	623.7796	592.9809	510.6661	411.4527	278.1472	165.9258	115.7489	(83)
Total gains	591.8168	712.8476	812.5743	937.5223	1021.4187	1023.5327	977.5949	894.3591	806.6147	684.8706	596.0474	560.2542	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.2507	48.3541	48.4559	48.9399	49.0315	49.4625	49.4625	49.5432	49.2956	49.0315	48.8465	48.6546	
alpha	4.2167	4.2236	4.2304	4.2627	4.2688	4.2975	4.2975	4.3029	4.2864	4.2688	4.2564	4.2436	
util living area	0.9956	0.9900	0.9769	0.9335	0.8329	0.6614	0.5039	0.5654	0.8068	0.9598	0.9911	0.9966	(86)
MIT	19.2826	19.5192	19.8663	20.3338	20.7118	20.9234	20.9812	20.9698	20.8157	20.3119	19.7158	19.2465	(87)
Th 2	19.7656	19.7679	19.7702	19.7808	19.7828	19.7920	19.7920	19.7937	19.7884	19.7828	19.7787	19.7746	(88)
util rest of house	0.9942	0.9867	0.9688	0.9097	0.7755	0.5594	0.3731	0.4300	0.7209	0.9406	0.9875	0.9954	(89)
MIT 2	18.2281	18.4644	18.8081	19.2636	19.5978	19.7591	19.7877	19.7858	19.6925	19.2545	18.6692	18.1987	(90)
Living area fraction									fLA = Living area / (4) =			0.3070	(91)
MIT	18.5518	18.7882	19.1329	19.5922	19.9398	20.1165	20.1541	20.1493	20.0373	19.5791	18.9905	18.5204	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5518	18.7882	19.1329	19.5922	19.9398	20.1165	20.1541	20.1493	20.0373	19.5791	18.9905	18.5204	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9830	0.9633	0.9053	0.7838	0.5886	0.4136	0.4717	0.7409	0.9364	0.9842	0.9937	(94)
Useful gains	587.1450	700.7267	782.7672	848.7228	800.6045	602.4645	404.2914	421.9092	597.6513	641.3045	586.6524	556.7056	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1685.5494	1639.0328	1487.7575	1246.7457	958.9943	636.4484	410.0385	431.8572	687.3125	1045.0412	1389.1253	1679.5949	(97)
Space heating kWh	817.2129	630.5417	524.5128	286.5765	117.8420	0.0000	0.0000	0.0000	0.0000	300.3801	577.7805	835.4296	(98a)
Space heating requirement - total per year (kWh/year)												4090.2761	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	817.2129	630.5417	524.5128	286.5765	117.8420	0.0000	0.0000	0.0000	0.0000	300.3801	577.7805	835.4296	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4090.2761	
Space heating per m2											(98c) / (4) =	48.3141	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1084.4912	853.7484	875.3952	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8347	0.8981	0.8629	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	905.2537	766.7106	755.3532	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1151.5211	1100.0704	1005.0399	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	177.3125	248.0197	185.7669	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	44.3281	62.0049	46.4417	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												152.7748	(107)
Energy for space heating												48.3141	(99)
Energy for space cooling												1.8046	(108)

Total	50.1187 (109)
Fabric Energy Efficiency (TFEE)	50.1 (109)

Full SAP Calculation Printout

Plot Reference	P-06	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-06
Plot Address	Flat 6, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	7.11	**TER**	15.54
Environmental	94 A	**% DER < TER**			54.25
CO_2 Emissions (t/year)	0.5	**DFEE**	50.62	**TFEE**	50.12
Compliance Check	See BREL	**% DFEE < TFEE**			-1.01
% DPER < TPER	11.28	**DPER**	73.12	**TPER**	82.41

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	84.6600	(1b)	x 2.8000	(2b) =	237.0480	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	237.0480	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7900 (17)
Infiltration rate		0.1395 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1186 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		71.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2952	0.2922	0.2893	0.2744	0.2715	0.2566	0.2566	0.2537	0.2626	0.2715	0.2774	0.2833	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			15.3300	1.1450	17.5534			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Brickwork	98.1900	26.7400	71.4500	0.2100	15.0045	110.0000	7859.5003	(29a)
Communal Wall	28.1300	2.1500	25.9800	0.2200	5.7156	110.0000	2857.7999	(29a)
Lift Shaft Wall	8.9800		8.9800	0.1600	1.4368	110.0000	987.7999	(29a)
Stairwell Wall	7.4800		7.4800	0.2200	1.6456	110.0000	822.8000	(29a)
Cold Roof	84.6600		84.6600	0.0900	7.6194	9.0000	761.9400	(30)
Total net area of external elements Aum(A, m2)			227.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.6551			(33)
Main dwelling								
Party Floor 1			84.6600			70.0000	5926.2000	(32d)
Internal Wall 1			147.5100			9.0000	1327.5900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20543.6301 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.6604 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.7200	0.0380	1.5854
E18 Party wall between dwellings	11.4000	0.0380	0.4332
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E16 Corner (normal)	22.8100	0.0540	1.2317
E10 Eaves (insulation at ceiling level)	40.6600	0.0630	2.5616
E2 Other lintels (including other steel lintels)	12.5600	0.0500	0.6280
E4 Jamb	42.6000	0.0160	0.6816
E12 Gable (insulation at ceiling level)	9.8300	0.0980	0.9633
E5 Ground floor (normal)	42.1100	0.1120	4.7163
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.9210 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 78.5761 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.0909	22.8591	22.6272	21.4677	21.2358	20.0764	20.0764	19.8445	20.5402	21.2358	21.6996	22.1634	(38)
Heat transfer coeff	101.6671	101.4352	101.2033	100.0438	99.8120	98.6525	98.6525	98.4206	99.1163	99.8120	100.2757	100.7395	(39)

Average = Sum(39)m / 12 = 99.9859

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2009	1.1981	1.1954	1.1817	1.1790	1.1653	1.1653	1.1625	1.1708	1.1790	1.1845	1.1899	(40)
HLP (average)												1.1810	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5454 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	66.8971	65.8917	64.4268	61.6238	59.5553	57.2485	55.9374	57.3912	58.9850	61.4617	64.3249	66.6407	(42a)
Hot water usage for baths	28.8911	28.4621	27.8578	26.7438	25.9095	24.9845	24.4849	25.0849	25.7382	26.7280	27.8650	28.7935	(42b)
Hot water usage for other uses	40.6970	39.2171	37.7373	36.2574	34.7775	33.2976	33.2976	34.7775	36.2574	37.7373	39.2171	40.6970	(42c)

Average daily hot water use (litres/day) 125.4608 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	136.4852	133.5709	130.0219	124.6249	120.2423	115.5306	113.7198	117.2536	120.9805	125.9270	131.4070	136.1313	(44)
Energy conte	216.1593	190.2032	199.8388	170.6053	161.8693	142.0584	137.5343	145.1844	149.1810	170.8817	187.2134	213.1487	(45)

Energy content (annual) Total = Sum(45)m = 2083.8778

Distribution loss (46)m = 0.15 x (45)m

	32.4239	28.5305	29.9758	25.5908	24.2804	21.3088	20.6301	21.7777	22.3772	25.6323	28.0820	31.9723	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(64)

Total per year (kWh/year) = Sum(64)m = 2401.2088 (64)

12Total per year (kWh/year) 2401 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	71.8730	63.2426	66.4464	56.7263	53.8215	47.2344	45.7301	48.2738	49.6027	56.8182	62.2485	70.8719	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.4557	127.8260	115.4557	119.3043	115.4557	119.3043	115.4557	115.4557	119.3043	115.4557	119.3043	115.4557	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.9039	231.2792	225.2935	212.5507	196.4652	181.3470	171.2472	168.8719	174.8576	187.6004	203.6859	218.8041	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	(71)
Water heating gains (Table 5)	96.6034	94.1110	89.3097	78.7865	72.3408	65.6034	61.4652	64.8842	68.8926	76.3685	86.4562	95.2580	(72)
Total internal gains	502.1435	514.3966	491.2393	471.8218	445.4421	427.4350	409.3486	410.3922	424.2349	440.6050	470.6268	490.6982	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.7500	36.7938	0.3300	0.0000	0.7700	72.4572	(77)
Southwest	5.1100	36.7938	0.3300	0.0000	0.7700	47.7750	(79)

Northwest			2.4700		11.2829		0.3300		0.0000		0.7700		7.0815 (81)
Northeast			11.4100		11.2829		0.3100		0.0000		0.7700		30.7298 (75)
Solar gains	158.0435	281.7659	418.8844	574.9346	695.0126	712.4365	677.5222	584.5064	472.3843	320.4061	191.5869	133.7723	(83)
Total gains	660.1870	796.1625	910.1238	1046.7564	1140.4547	1139.8715	1086.8708	994.8986	896.6192	761.0111	662.2137	624.4705	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.1299	56.2582	56.3871	57.0406	57.1731	57.8451	57.8451	57.9814	57.5744	57.1731	56.9087	56.6467	
alpha	4.7420	4.7505	4.7591	4.8027	4.8115	4.8563	4.8563	4.8654	4.8383	4.8115	4.7939	4.7764	
util living area	0.9930	0.9828	0.9582	0.8819	0.7333	0.5394	0.3966	0.4496	0.7013	0.9283	0.9850	0.9946	(86)
MIT	19.6616	19.9072	20.2347	20.6296	20.8815	20.9787	20.9961	20.9930	20.9288	20.5724	20.0449	19.6215	(87)
Th 2	19.9193	19.9215	19.9237	19.9347	19.9369	19.9479	19.9479	19.9501	19.9435	19.9369	19.9325	19.9281	(88)
util rest of house	0.9908	0.9776	0.9455	0.8489	0.6719	0.4569	0.3032	0.3498	0.6160	0.9000	0.9795	0.9929	(89)
MIT 2	18.3806	18.6927	19.1023	19.5786	19.8445	19.9366	19.9467	19.9478	19.8990	19.5282	18.8777	18.3357	(90)
Living area fraction									fLA = Living area / (4) =			0.3070	(91)
MIT	18.7739	19.0655	19.4500	19.9012	20.1628	20.2565	20.2689	20.2686	20.2151	19.8488	19.2360	18.7304	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7739	19.0655	19.4500	19.9012	20.1628	20.2565	20.2689	20.2686	20.2151	19.8488	19.2360	18.7304	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9876	0.9721	0.9386	0.8477	0.6858	0.4816	0.3319	0.3805	0.6393	0.8972	0.9746	0.9901	(94)
Useful gains	651.9684	773.9331	854.2445	887.3842	782.0832	549.0160	360.7818	378.5510	573.2343	682.7712	645.3916	618.3044	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1471.5144	1436.8811	1310.5781	1100.6052	844.6897	558.0286	361.9415	380.7547	606.1105	923.1372	1216.9487	1463.7904	(97)
Space heating kWh	609.7423	445.5011	339.5122	153.5191	46.5793	0.0000	0.0000	0.0000	0.0000	178.8323	411.5211	629.0416	(98a)
Space heating requirement - total per year (kWh/year)												2814.2488	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	609.7423	445.5011	339.5122	153.5191	46.5793	0.0000	0.0000	0.0000	0.0000	178.8323	411.5211	629.0416	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2814.2488	
Space heating per m2											(98c) / (4) =	33.2418	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	609.7423	445.5011	339.5122	153.5191	46.5793	0.0000	0.0000	0.0000	0.0000	178.8323	411.5211	629.0416	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	609.7423	445.5011	339.5122	153.5191	46.5793	0.0000	0.0000	0.0000	0.0000	178.8323	411.5211	629.0416	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	74.9139	66.1119	69.8848	60.6087	58.1846	51.8120	50.6858	53.0432	54.0069	60.9618	65.7264	73.9862	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	18.5689	16.7719	18.5689	17.9699	18.5689	17.9699	18.5689	18.5689	17.9699	18.5689	17.9699	18.5689	(231)
Lighting	23.4991	18.8518	16.9740	12.4359	9.6058	7.8480	8.7628	11.3902	14.7947	19.4114	21.9252	24.1522	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2814.2488	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	739.9263	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	218.6341	(230a)
Total electricity for the above, kWh/year	218.6341	(231)
Electricity for lighting (calculated in Appendix L)	189.6511	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3962.4604	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2814.2488	0.1562	439.7099	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	739.9263	0.1412	104.4772	(264)
Space and water heating			544.1870	(265)
Pumps, fans and electric keep-hot	218.6341	0.1387	30.3272	(267)
Energy for lighting	189.6511	0.1443	27.3725	(268)
Total CO2, kg/year			601.8868	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.1100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2814.2488	1.5784	4442.0893	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	739.9263	1.5221	1126.2559	(278)
Space and water heating			5568.3452	(279)
Pumps, fans and electric keep-hot	218.6341	1.5128	330.7497	(281)
Energy for lighting	189.6511	1.5338	290.8932	(282)
Total Primary energy kWh/year			6189.9881	(286)
Dwelling Primary energy Rate (DPER)			73.1200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	84.6600	(1b) x	2.8000	(2b) =	237.0480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		237.0480	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1266	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3766	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3201	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4081	0.4001	0.3921	0.3521	0.3441	0.3041	0.3041	0.2961	0.3201	0.3441	0.3601	0.3761	(22b)
Effective ac	0.5833	0.5800	0.5769	0.5620	0.5592	0.5462	0.5462	0.5438	0.5512	0.5592	0.5648	0.5707	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.0100	1.1450	21.7672			(27)
Brickwork	98.1900	19.0100	79.1800	0.1800	14.2524			(29a)
Communal Wall	28.1300	2.1500	25.9800	0.1800	4.6764			(29a)
Lift Shaft Wall	8.9800		8.9800	0.1800	1.6164			(29a)
Stairwell Wall	7.4800		7.4800	0.1800	1.3464			(29a)
Cold Roof	84.6600		84.6600	0.1100	9.3126			(30)
Total net area of external elements Aum(A, m2)			227.4400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.1214			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		242.6604 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	41.7200	0.0700	2.9204
E18 Party wall between dwellings	11.4000	0.0600	0.6840
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.0200	0.0540
E16 Corner (normal)	22.8100	0.0900	2.0529
E10 Eaves (insulation at ceiling level)	40.6600	0.0600	2.4396
E2 Other lintels (including other steel lintels)	12.5600	0.0500	0.6280
E4 Jamb	42.6000	0.0500	2.1300
E12 Gable (insulation at ceiling level)	9.8300	0.0600	0.5898
E5 Ground floor (normal)	42.1100	0.1600	6.7376
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0900	-0.7155

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.5208 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	72.6422 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.6268	45.3738	45.1259	43.9614	43.7435	42.7292	42.7292	42.5414	43.1199	43.7435	44.1843	44.6451	(38)
Heat transfer coeff	118.2690	118.0160	117.7681	116.6036	116.3857	115.3714	115.3714	115.1836	115.7621	116.3857	116.8264	117.2873	(39)
Average = Sum(39)m / 12 =												116.6025	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3970	1.3940	1.3911	1.3773	1.3747	1.3628	1.3628	1.3605	1.3674	1.3747	1.3799	1.3854	(40)
HLP (average)												1.3773	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5454 (42)

Hot water usage for mixer showers

66.8971	65.8917	64.4268	61.6238	59.5553	57.2485	55.9374	57.3912	58.9850	61.4617	64.3249	66.6407	(42a)

Hot water usage for baths

28.8911	28.4621	27.8578	26.7438	25.9095	24.9845	24.4849	25.0849	25.7382	26.7280	27.8650	28.7935	(42b)

Hot water usage for other uses

40.6970	39.2171	37.7373	36.2574	34.7775	33.2976	33.2976	34.7775	36.2574	37.7373	39.2171	40.6970	(42c)

Average daily hot water use (litres/day)		125.4608 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	136.4852	133.5709	130.0219	124.6249	120.2423	115.5306	113.7198	117.2536	120.9805	125.9270	131.4070	136.1313	(44)
Energy conte	216.1593	190.2032	199.8388	170.6053	161.8693	142.0584	137.5343	145.1844	149.1810	170.8817	187.2134	213.1487	(45)
Energy content (annual)										Total = Sum(45)m =		2083.8778	
Distribution loss (46)m = 0.15 x (45)m	32.4239	28.5305	29.9758	25.5908	24.2804	21.3088	20.6301	21.7777	22.3772	25.6323	28.0820	31.9723	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	262.7542	232.2890	246.4337	215.6971	208.4642	187.1502	184.1292	191.7793	194.2729	217.4766	232.3053	259.7436	(62)
WWHRS	-30.5825	-27.0475	-28.3225	-23.4522	-21.8566	-18.7028	-17.5309	-18.6424	-19.3507	-22.8123	-25.8436	-30.0162	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1716	205.2415	218.1111	192.2450	186.6076	168.4474	166.5982	173.1370	174.9222	194.6643	206.4617	229.7274	(64)
									Total per year (kWh/year) = Sum(64)m =			2348.3350	(64)
12Total per year (kWh/year)												2348	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.1489	96.9112	103.7223	92.7997	91.0975	83.3079	83.0061	85.5497	85.6762	94.0941	98.3219	108.1479	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	127.2680	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.4423	127.8111	115.4423	119.2904	115.4423	119.2904	115.4423	115.4423	119.2904	115.4423	119.2904	115.4423	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.9039	231.2792	225.2935	212.5507	196.4652	181.3470	171.2472	168.8719	174.8576	187.6004	203.6859	218.8041	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	35.7268	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	(71)
Water heating gains (Table 5)													
	146.7055	144.2130	139.4117	128.8885	122.4428	115.7054	111.5673	114.9862	118.9947	126.4705	136.5582	145.3600	(72)
Total internal gains													
	555.2321	567.4838	544.3279	524.9100	498.5307	477.5232	459.4371	460.4808	474.3230	493.6936	523.7149	543.7868	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.1100	11.2829	0.6300	0.7000	0.7700	27.9650	(75)
Southeast	5.5100	36.7938	0.6300	0.7000	0.7700	61.9582	(77)
Southwest	3.6300	36.7938	0.6300	0.7000	0.7700	40.8182	(79)
Northwest	1.7600	11.2829	0.6300	0.7000	0.7700	6.0689	(81)

Solar gains	136.8102	244.3430	364.3480	501.7751	607.9691	623.7796	592.9809	510.6661	411.4527	278.1472	165.9258	115.7489	(83)
Total gains	692.0423	811.8268	908.6760	1026.6851	1106.4997	1101.3028	1052.4180	971.1469	885.7756	771.8408	689.6407	659.5357	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.2507	48.3541	48.4559	48.9399	49.0315	49.4625	49.4625	49.5432	49.2956	49.0315	48.8465	48.6546	
alpha	4.2167	4.2236	4.2304	4.2627	4.2688	4.2975	4.2975	4.3029	4.2864	4.2688	4.2564	4.2436	
util living area													
	0.9922	0.9840	0.9663	0.9135	0.8012	0.6254	0.4712	0.5265	0.7667	0.9414	0.9848	0.9936	(86)
MIT	19.4033	19.6346	19.9709	20.4118	20.7563	20.9381	20.9854	20.9769	20.8510	20.3981	19.8257	19.3669	(87)
Th 2	19.7656	19.7679	19.7702	19.7808	19.7828	19.7920	19.7920	19.7937	19.7884	19.7828	19.7787	19.7746	(88)
util rest of house													
	0.9896	0.9789	0.9551	0.8848	0.7393	0.5250	0.3474	0.3977	0.6758	0.9156	0.9790	0.9915	(89)
MIT 2	17.9461	18.2406	18.6641	19.2058	19.5870	19.7588	19.7878	19.7862	19.6927	19.2047	18.4931	17.9058	(90)
Living area fraction									fLA = Living area / (4) =			0.3070	(91)
MIT	18.3935	18.6686	19.0652	19.5760	19.9459	20.1208	20.1554	20.1517	20.0483	19.5711	18.9022	18.3543	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3935	18.6686	19.0652	19.5760	19.9459	20.1208	20.1554	20.1517	20.0483	19.5711	18.9022	18.3543	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9855	0.9726	0.9468	0.8790	0.7485	0.5538	0.3856	0.4373	0.6975	0.9099	0.9731	0.9879	(94)
Useful gains	681.9997	789.5606	860.3413	902.4929	828.2657	609.9275	405.8021	424.6794	617.7983	702.2618	671.0926	651.5646	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1666.8191	1624.9148	1479.7848	1244.8623	959.7091	636.9448	410.1968	432.1396	688.5835	1044.1046	1378.8066	1660.1245	(97)
Space heating kWh													
	732.7056	561.3581	460.8660	246.5060	97.7939	0.0000	0.0000	0.0000	0.0000	254.3311	509.5541	750.3686	(98a)
Space heating requirement - total per year (kWh/year)												3613.4833	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	732.7056	561.3581	460.8660	246.5060	97.7939	0.0000	0.0000	0.0000	0.0000	254.3311	509.5541	750.3686	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3613.4833	
Space heating per m2											(98c) / (4) =	42.6823	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	732.7056	561.3581	460.8660	246.5060	97.7939	0.0000	0.0000	0.0000	0.0000	254.3311	509.5541	750.3686	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	793.8306	608.1886	499.3131	267.0704	105.9522	0.0000	0.0000	0.0000	0.0000	275.5483	552.0630	812.9670	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	232.1716	205.2415	218.1111	192.2450	186.6076	168.4474	166.5982	173.1370	174.9222	194.6643	206.4617	229.7274	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4538	86.1973	85.6953	84.6184	82.6815	79.8000	79.8000	79.8000	79.8000	84.6603	86.0031	86.5130	(217)
Fuel for water heating, kWh/month													
	268.5499	238.1068	254.5193	227.1905	225.6945	211.0870	208.7697	216.9636	219.2008	229.9356	240.0630	265.5408	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.9866	19.2430	17.3262	12.6939	9.8051	8.0109	8.9446	11.6265	15.1016	19.8142	22.3801	24.6533	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-22.4980	-33.2333	-50.0227	-58.9786	-65.9849	-62.4511	-61.6749	-57.0313	-49.2697	-39.1842	-25.2618	-19.2772	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-8.4917	-18.2198	-36.8890	-56.4137	-75.5951	-76.3348	-75.4507	-63.4352	-45.9006	-26.3993	-11.4458	-6.6898 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3914.9332	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2805.6214	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	193.5858	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1046.1332	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5954.0072	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3914.9332	0.2100	822.1360	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2805.6214	0.2100	589.1805	(264)
Space and water heating			1411.3165	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	193.5858	0.1443	27.9404	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-544.8676	0.1336	-72.8061	
PV Unit electricity exported	-501.2656	0.1254	-62.8416	
Total			-135.6477	(269)
Total CO2, kg/year			1315.5384	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3914.9332	1.1300	4423.8745	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2805.6214	1.1300	3170.3522	(278)
Space and water heating			7594.2267	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	193.5858	1.5338	296.9284	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-544.8676	1.4938	-813.9169	
PV Unit electricity exported	-501.2656	0.4602	-230.6590	
Total			-1044.5759	(283)
Total Primary energy kWh/year			6976.6799	(286)
Target Primary Energy Rate (TPER)			82.4100	(287)

Full SAP Calculation Printout

Plot Reference	P-06	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-06
Plot Address	Flat 6, 2 Carters Close, Reading, RG1 8GQ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	7.11	**TER**	15.54
Environmental	94 A	**% DER < TER**			54.25
CO_2 Emissions (t/year)	0.5	**DFEE**	50.62	**TFEE**	50.12
Compliance Check	See BREL	**% DFEE < TFEE**			-1.01
% DPER < TPER	11.28	**DPER**	73.12	**TPER**	82.41

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	84.6600	(1b)	x 2.8000	(2b) =	237.0480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	237.0480	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7900 (17)
Infiltration rate		0.1395 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1186 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		71.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2952	0.2922	0.2893	0.2744	0.2715	0.2566	0.2566	0.2537	0.2626	0.2715	0.2774	0.2833	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			15.3300	1.1450	17.5534			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Brickwork	98.1900	26.7400	71.4500	0.2100	15.0045	110.0000	7859.5003	(29a)
Communal Wall	28.1300	2.1500	25.9800	0.2200	5.7156	110.0000	2857.7999	(29a)
Lift Shaft Wall	8.9800		8.9800	0.1600	1.4368	110.0000	987.7999	(29a)
Stairwell Wall	7.4800		7.4800	0.2200	1.6456	110.0000	822.8000	(29a)
Cold Roof	84.6600		84.6600	0.0900	7.6194	9.0000	761.9400	(30)
Total net area of external elements Aum(A, m2)			227.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.6551			(33)
Main dwelling								
Party Floor 1			84.6600			70.0000	5926.2000	(32d)
Internal Wall 1			147.5100			9.0000	1327.5900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20543.6301 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.6604 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.7200	0.0380	1.5854
E18 Party wall between dwellings	11.4000	0.0380	0.4332
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E16 Corner (normal)	22.8100	0.0540	1.2317
E10 Eaves (insulation at ceiling level)	40.6600	0.0630	2.5616
E2 Other lintels (including other steel lintels)	12.5600	0.0500	0.6280
E4 Jamb	42.6000	0.0160	0.6816
E12 Gable (insulation at ceiling level)	9.8300	0.0980	0.9633
E5 Ground floor (normal)	42.1100	0.1120	4.7163
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.9210 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 78.5761 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.0909	22.8591	22.6272	21.4677	21.2358	20.0764	20.0764	19.8445	20.5402	21.2358	21.6996	22.1634	(38)
Heat transfer coeff	101.6671	101.4352	101.2033	100.0438	99.8120	98.6525	98.6525	98.4206	99.1163	99.8120	100.2757	100.7395	(39)

Average = Sum(39)m / 12 = 99.9859

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2009	1.1981	1.1954	1.1817	1.1790	1.1653	1.1653	1.1625	1.1708	1.1790	1.1845	1.1899	(40)
HLP (average)												1.1810	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5454 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	66.8971	65.8917	64.4268	61.6238	59.5553	57.2485	55.9374	57.3912	58.9850	61.4617	64.3249	66.6407	(42a)
Hot water usage for baths	28.8911	28.4621	27.8578	26.7438	25.9095	24.9845	24.4849	25.0849	25.7382	26.7280	27.8650	28.7935	(42b)
Hot water usage for other uses	40.6970	39.2171	37.7373	36.2574	34.7775	33.2976	33.2976	34.7775	36.2574	37.7373	39.2171	40.6970	(42c)

Average daily hot water use (litres/day) 125.4608 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	136.4852	133.5709	130.0219	124.6249	120.2423	115.5306	113.7198	117.2536	120.9805	125.9270	131.4070	136.1313	(44)
Energy conte	216.1593	190.2032	199.8388	170.6053	161.8693	142.0584	137.5343	145.1844	149.1810	170.8817	187.2134	213.1487	(45)
Energy content (annual)										Total = Sum(45)m =		2083.8778	
Distribution loss (46)m = 0.15 x (45)m	32.4239	28.5305	29.9758	25.5908	24.2804	21.3088	20.6301	21.7777	22.3772	25.6323	28.0820	31.9723	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(64)

Total per year (kWh/year) = Sum(64)m = 2401.2088 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	71.8730	63.2426	66.4464	56.7263	53.8215	47.2344	45.7301	48.2738	49.6027	56.8182	62.2485	70.8719	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.8471	23.8453	19.3923	14.6812	10.9744	9.2651	10.0112	13.0130	17.4660	22.1771	25.8839	27.5932	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.6476	345.1929	336.2590	317.2398	293.2316	270.6672	255.5928	252.0475	260.9814	280.0006	304.0089	326.5732	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	(71)
Water heating gains (Table 5)	96.6034	94.1110	89.3097	78.7865	72.3408	65.6034	61.4652	64.8842	68.8926	76.3685	86.4562	95.2580	(72)
Total internal gains	568.8229	566.8739	548.6857	514.4323	480.2715	449.2603	430.7940	433.6694	451.0648	482.2709	520.0737	553.1492	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.7500	36.7938	0.3300	0.0000	0.7700	72.4572	(77)
Southwest	5.1100	36.7938	0.3300	0.0000	0.7700	47.7750	(79)
Northwest	2.4700	11.2829	0.3300	0.0000	0.7700	7.0815	(81)

Northeast				11.4100		11.2829		0.3100		0.0000		0.7700	30.7298 (75)
Solar gains	158.0435	281.7659	418.8844	574.9346	695.0126	712.4365	677.5222	584.5064	472.3843	320.4061	191.5869	133.7723 (83)	
Total gains	726.8664	848.6398	967.5702	1089.3669	1175.2841	1161.6968	1108.3162	1018.1758	923.4491	802.6769	711.6605	686.9215 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.1299	56.2582	56.3871	57.0406	57.1731	57.8451	57.8451	57.9814	57.5744	57.1731	56.9087	56.6467	
alpha	4.7420	4.7505	4.7591	4.8027	4.8115	4.8563	4.8563	4.8654	4.8383	4.8115	4.7939	4.7764	
util living area	0.9897	0.9781	0.9484	0.8682	0.7183	0.5303	0.3891	0.4398	0.6863	0.9152	0.9801	0.9920	(86)
MIT	19.7435	19.9682	20.2933	20.6589	20.8917	20.9802	20.9964	20.9936	20.9352	20.6087	20.1031	19.6991	(87)
Th 2	19.9193	19.9215	19.9237	19.9347	19.9369	19.9479	19.9479	19.9501	19.9435	19.9369	19.9325	19.9281	(88)
util rest of house	0.9865	0.9715	0.9333	0.8331	0.6565	0.4487	0.2974	0.3419	0.6010	0.8834	0.9730	0.9895	(89)
MIT 2	18.4843	18.7688	19.1724	19.6099	19.8531	19.9374	19.9468	19.9480	19.9034	19.5682	18.9502	18.4342	(90)
Living area fraction										fLA = Living area / (4) =		0.3070	(91)
MIT	18.8709	19.1370	19.5165	19.9319	20.1720	20.2575	20.2690	20.2690	20.2201	19.8876	19.3041	18.8225	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8709	19.1370	19.5165	19.9319	20.1720	20.2575	20.2690	20.2690	20.2201	19.8876	19.3041	18.8225	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9823	0.9654	0.9264	0.8330	0.6709	0.4732	0.3256	0.3720	0.6246	0.8817	0.9675	0.9859	(94)
Useful gains	713.9980	819.2575	896.3741	907.4677	788.5162	549.7693	360.8926	378.7918	576.7957	707.7158	688.5126	677.2163	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1481.3760	1444.1318	1317.3138	1103.6787	845.6034	558.1310	361.9576	380.7890	606.6063	927.0185	1223.7752	1473.0668	(97)
Space heating kWh	570.9292	419.9155	313.1791	141.2719	42.4728	0.0000	0.0000	0.0000	0.0000	163.1612	385.3891	592.1128	(98a)
Space heating requirement - total per year (kWh/year)												2628.4317	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	570.9292	419.9155	313.1791	141.2719	42.4728	0.0000	0.0000	0.0000	0.0000	163.1612	385.3891	592.1128	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2628.4317	
Space heating per m2											(98c) / (4) =	31.0469	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	570.9292	419.9155	313.1791	141.2719	42.4728	0.0000	0.0000	0.0000	0.0000	163.1612	385.3891	592.1128	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	570.9292	419.9155	313.1791	141.2719	42.4728	0.0000	0.0000	0.0000	0.0000	163.1612	385.3891	592.1128	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	74.9139	66.1119	69.8848	60.6087	58.1846	51.8120	50.6858	53.0432	54.0069	60.9618	65.7264	73.9862	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	18.5689	16.7719	18.5689	17.9699	18.5689	17.9699	18.5689	18.5689	17.9699	18.5689	17.9699	18.5689	(231)
Lighting	23.4991	18.8518	16.9740	12.4359	9.6058	7.8480	8.7628	11.3902	14.7947	19.4114	21.9252	24.1522	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2628.4317	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	324.5200	
Water heating fuel used	739.9263	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	218.6341	(230a)
Total electricity for the above, kWh/year	218.6341	(231)
Electricity for lighting (calculated in Appendix L)	189.6511	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3776.6432	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2628.4317	16.4900	433.4284	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	739.9263	16.4900	122.0138	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	218.6341	16.4900	36.0528	(249)
Energy for lighting	189.6511	16.4900	31.2735	(250)
Additional standing charges			0.0000	(251)
Total energy cost			622.7685	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.7291	(257)
SAP value		71.9711	
SAP rating (Section 12)		72	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2628.4317	0.1563	410.8707	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	739.9263	0.1412	104.4772	(264)
Space and water heating			515.3479	(265)
Pumps, fans and electric keep-hot	218.6341	0.1387	30.3272	(267)
Energy for lighting	189.6511	0.1443	27.3725	(268)
Total CO2, kg/year			573.0476	(272)
CO2 emissions per m2			6.7700	(273)
EI value			94.0777	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	84.6600	(1b) x	2.8000	(2b) =	237.0480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		237.0480	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.7900	(17)
Infiltration rate	0.1395	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1186	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1275	0.1215	0.1215	0.1126	0.1156	0.1008	0.1008	0.0978	0.1008	0.1126	0.1097	0.1186	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	71.2000	(23c)

Effective ac	0.2715	0.2655	0.2655	0.2566	0.2596	0.2448	0.2448	0.2418	0.2448	0.2566	0.2537	0.2626	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			15.3300	1.1450	17.5534			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Brickwork	98.1900	26.7400	71.4500	0.2100	15.0045	110.0000	7859.5003	(29a)
Communal Wall	28.1300	2.1500	25.9800	0.2200	5.7156	110.0000	2857.7999	(29a)
Lift Shaft Wall	8.9800		8.9800	0.1600	1.4368	110.0000	987.7999	(29a)
Stairwell Wall	7.4800		7.4800	0.2200	1.6456	110.0000	822.8000	(29a)
Cold Roof	84.6600		84.6600	0.0900	7.6194	9.0000	761.9400	(30)
Total net area of external elements Aum(A, m2)			227.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.6551			(33)
Main dwelling								
Party Floor 1			84.6600			70.0000	5926.2000	(32d)
Internal Wall 1			147.5100			9.0000	1327.5900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	20543.6301	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.6604	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.7200	0.0380	1.5854
E18 Party wall between dwellings	11.4000	0.0380	0.4332
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E16 Corner (normal)	22.8100	0.0540	1.2317
E10 Eaves (insulation at ceiling level)	40.6600	0.0630	2.5616
E2 Other lintels (including other steel lintels)	12.5600	0.0500	0.6280
E4 Jamb	42.6000	0.0160	0.6816
E12 Gable (insulation at ceiling level)	9.8300	0.0980	0.9633
E5 Ground floor (normal)	42.1100	0.1120	4.7163
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.9210	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	78.5761	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.2358	20.7720	20.7720	20.0764	20.3083	19.1488	19.1488	18.9169	19.1488	20.0764	19.8445	20.5402	(38)
Heat transfer coeff	99.8120	99.3482	99.3482	98.6525	98.8844	97.7249	97.7249	97.4931	97.7249	98.6525	98.4206	99.1163	(39)
Average = Sum(39)m / 12 =												98.5752	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1790	1.1735	1.1735	1.1653	1.1680	1.1543	1.1543	1.1516	1.1543	1.1653	1.1625	1.1708	(40)
HLP (average)												1.1644	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5454	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
66.8971	65.8917	64.4268	61.6238	59.5553	57.2485	55.9374	57.3912	58.9850	61.4617	64.3249	66.6407	(42a)

Hot water usage for baths

28.8911	28.4621	27.8578	26.7438	25.9095	24.9845	24.4849	25.0849	25.7382	26.7280	27.8650	28.7935	(42b)

Hot water usage for other uses

40.6970	39.2171	37.7373	36.2574	34.7775	33.2976	33.2976	34.7775	36.2574	37.7373	39.2171	40.6970	(42c)

Average daily hot water use (litres/day)	125.4608	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
136.4852	133.5709	130.0219	124.6249	120.2423	115.5306	113.7198	117.2536	120.9805	125.9270	131.4070	136.1313	(44)
Energy conte 216.1593	190.2032	199.8388	170.6053	161.8693	142.0584	137.5343	145.1844	149.1810	170.8817	187.2134	213.1487	(45)

Energy content (annual) Total = Sum(45)m =	2083.8778	
Distribution loss (46)m = 0.15 x (45)m		

32.4239	28.5305	29.9758	25.5908	24.2804	21.3088	20.6301	21.7777	22.3772	25.6323	28.0820	31.9723	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(64)
											Total per year (kWh/year) = Sum(64)m =	2401.2088	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	71.8730	63.2426	66.4464	56.7263	53.8215	47.2344	45.7301	48.2738	49.6027	56.8182	62.2485	70.8719	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	26.8471	23.8453	19.3923	14.6812	10.9744	9.2651	10.0112	13.0130	17.4660	22.1771	25.8839	27.5932	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	341.6476	345.1929	336.2590	317.2398	293.2316	270.6672	255.5928	252.0475	260.9814	280.0006	304.0089	326.5732	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	(71)
Water heating gains (Table 5)													
	96.6034	94.1110	89.3097	78.7865	72.3408	65.6034	61.4652	64.8842	68.8926	76.3685	86.4562	95.2580	(72)
Total internal gains													
	568.8229	566.8739	548.6857	514.4323	480.2715	449.2603	430.7940	433.6694	451.0648	482.2709	520.0737	553.1492	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.7500	43.0593	0.3300	0.0000	0.7700	84.7956	(77)
Southwest	5.1100	43.0593	0.3300	0.0000	0.7700	55.9104	(79)
Northwest	2.4700	13.7804	0.3300	0.0000	0.7700	8.6490	(81)
Northeast	11.4100	13.7804	0.3100	0.0000	0.7700	37.5319	(75)

Solar gains	186.8868	291.9590	433.2167	607.4265	718.0183	779.4121	733.5887	647.2386	522.1397	356.9870	223.3337	159.0047	(83)
Total gains	755.7097	858.8330	981.9024	1121.8588	1198.2898	1228.6724	1164.3827	1080.9080	973.2044	839.2579	743.4074	712.1539	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.1731	57.4400	57.4400	57.8451	57.7094	58.3941	58.3941	58.5330	58.3941	57.8451	57.9814	57.5744	
alpha	4.8115	4.8293	4.8293	4.8563	4.8473	4.8929	4.8929	4.9022	4.8929	4.8563	4.8654	4.8383	
util living area													
	0.9850	0.9714	0.9307	0.8191	0.6337	0.4103	0.2766	0.3060	0.5814	0.8716	0.9689	0.9881	(86)
MIT	19.9136	20.1149	20.4357	20.7723	20.9462	20.9948	20.9994	20.9991	20.9734	20.7341	20.2768	19.8737	(87)
Th 2	19.9369	19.9413	19.9413	19.9479	19.9457	19.9567	19.9567	19.9589	19.9567	19.9479	19.9501	19.9435	(88)
util rest of house													
	0.9804	0.9627	0.9106	0.7742	0.5631	0.3296	0.1894	0.2127	0.4894	0.8263	0.9576	0.9844	(89)
MIT 2	18.7125	18.9674	19.3586	19.7444	19.9092	19.9547	19.9566	19.9588	19.9432	19.7158	19.1797	18.6672	(90)
Living area fraction											fLA = Living area / (4) =	0.3070	(91)
MIT	19.0813	19.3197	19.6892	20.0599	20.2276	20.2740	20.2768	20.2781	20.2594	20.0284	19.5165	19.0376	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0813	19.3197	19.6892	20.0599	20.2276	20.2740	20.2768	20.2781	20.2594	20.0284	19.5165	19.0376	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9753	0.9562	0.9049	0.7794	0.5827	0.3544	0.2162	0.2414	0.5169	0.8303	0.9517	0.9799	(94)
Useful gains	737.0688	821.2523	888.5693	874.3887	698.1853	435.4239	251.7040	260.9134	503.0547	696.8155	707.5219	697.8728	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1395.4966	1353.0886	1220.9143	1002.3021	724.5840	437.2230	251.8140	261.1006	513.9782	841.3505	1133.4622	1381.4440	(97)
Space heating kWh													
	489.8702	357.3940	247.2647	92.0976	19.6407	0.0000	0.0000	0.0000	0.0000	107.5340	306.6770	508.5769	(98a)
Space heating requirement - total per year (kWh/year)												2129.0552	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	489.8702	357.3940	247.2647	92.0976	19.6407	0.0000	0.0000	0.0000	0.0000	107.5340	306.6770	508.5769	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2129.0552	
Space heating per m2											(98c) / (4) =	25.1483	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Space heating requirement													
	489.8702	357.3940	247.2647	92.0976	19.6407	0.0000	0.0000	0.0000	0.0000	107.5340	306.6770	508.5769	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	489.8702	357.3940	247.2647	92.0976	19.6407	0.0000	0.0000	0.0000	0.0000	107.5340	306.6770	508.5769	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	74.9139	66.1119	69.8848	60.6087	58.1846	51.8120	50.6858	53.0432	54.0069	60.9618	65.7264	73.9862	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	18.5689	16.7719	18.5689	17.9699	18.5689	17.9699	18.5689	18.5689	17.9699	18.5689	17.9699	18.5689	(231)
Lighting	23.4991	18.8518	16.9740	12.4359	9.6058	7.8480	8.7628	11.3902	14.7947	19.4114	21.9252	24.1522	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2129.0552	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	739.9263	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	218.6341	(230a)
Total electricity for the above, kWh/year	218.6341	(231)
Electricity for lighting (calculated in Appendix L)	189.6511	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3277.2667	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2129.0552	27.6700	589.1096	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	739.9263	27.6700	204.7376	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	218.6341	27.6700	60.4961	(249)
Energy for lighting	189.6511	27.6700	52.4765	(250)
Additional standing charges			0.0000	(251)
Total energy cost			906.8197	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2129.0552	0.1571	334.4568	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	739.9263	0.1412	104.4772	(264)
Space and water heating			438.9340	(265)
Pumps, fans and electric keep-hot	218.6341	0.1387	30.3272	(267)
Energy for lighting	189.6511	0.1443	27.3725	(268)
Total CO2, kg/year			496.6337	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2129.0552	1.5816	3367.2182	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	739.9263	1.5221	1126.2559	(278)
Space and water heating			4493.4741	(279)
Pumps, fans and electric keep-hot	218.6341	1.5128	330.7497	(281)

Energy for lighting	189.6511	1.5338	290.8932 (282)
Total Primary energy kWh/year			5115.1170 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 72
Current environmental impact rating: A 94

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 72
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£907	£907	£0
Space heating	£650	£650	£0
Water heating	£205	£205	£0
Lighting	£52	£52	£0
Total cost of fuels	£907	£907	£0
Total cost of uses	£907	£907	£0
Delivered energy	39 kWh/m²	39 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	60 kWh/m²	60 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	84.6600 (1b)	x	2.8000 (2b)	=	237.0480 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.0480	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7900 (17)
Infiltration rate		0.1395 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1186 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1512	0.1482	0.1453	0.1304	0.1275	0.1126	0.1126	0.1097	0.1186	0.1275	0.1334	0.1393	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 71.2000 (23c)

Effective ac	0.2952	0.2922	0.2893	0.2744	0.2715	0.2566	0.2566	0.2537	0.2626	0.2715	0.2774	0.2833 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			15.3300	1.1450	17.5534			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Brickwork	98.1900	26.7400	71.4500	0.2100	15.0045	110.0000	7859.5003	(29a)
Communal Wall	28.1300	2.1500	25.9800	0.2200	5.7156	110.0000	2857.7999	(29a)
Lift Shaft Wall	8.9800		8.9800	0.1600	1.4368	110.0000	987.7999	(29a)
Stairwell Wall	7.4800		7.4800	0.2200	1.6456	110.0000	822.8000	(29a)
Cold Roof	84.6600		84.6600	0.0900	7.6194	9.0000	761.9400	(30)
Total net area of external elements Aum(A, m2)			227.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.6551			(33)
Main dwelling								
Party Floor 1			84.6600			70.0000	5926.2000	(32d)
Internal Wall 1			147.5100			9.0000	1327.5900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20543.6301 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.6604 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	41.7200	0.0380	1.5854
E18 Party wall between dwellings	11.4000	0.0380	0.4332
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E16 Corner (normal)	22.8100	0.0540	1.2317
E10 Eaves (insulation at ceiling level)	40.6600	0.0630	2.5616
E2 Other lintels (including other steel lintels)	12.5600	0.0500	0.6280
E4 Jamb	42.6000	0.0160	0.6816
E12 Gable (insulation at ceiling level)	9.8300	0.0980	0.9633
E5 Ground floor (normal)	42.1100	0.1120	4.7163
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.9210 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 78.5761 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.0909	22.8591	22.6272	21.4677	21.2358	20.0764	20.0764	19.8445	20.5402	21.2358	21.6996	22.1634	(38)
Heat transfer coeff	101.6671	101.4352	101.2033	100.0438	99.8120	98.6525	98.6525	98.4206	99.1163	99.8120	100.2757	100.7395	(39)

Average = Sum(39)m / 12 = 99.9859

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2009	1.1981	1.1954	1.1817	1.1790	1.1653	1.1653	1.1625	1.1708	1.1790	1.1845	1.1899	(40)
HLP (average)												1.1810	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5454 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	66.8971	65.8917	64.4268	61.6238	59.5553	57.2485	55.9374	57.3912	58.9850	61.4617	64.3249	66.6407	(42a)
Hot water usage for baths	28.8911	28.4621	27.8578	26.7438	25.9095	24.9845	24.4849	25.0849	25.7382	26.7280	27.8650	28.7935	(42b)
Hot water usage for other uses	40.6970	39.2171	37.7373	36.2574	34.7775	33.2976	33.2976	34.7775	36.2574	37.7373	39.2171	40.6970	(42c)

Average daily hot water use (litres/day) 125.4608 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	136.4852	133.5709	130.0219	124.6249	120.2423	115.5306	113.7198	117.2536	120.9805	125.9270	131.4070	136.1313	(44)
Energy conte	216.1593	190.2032	199.8388	170.6053	161.8693	142.0584	137.5343	145.1844	149.1810	170.8817	187.2134	213.1487	(45)

Energy content (annual) Total = Sum(45)m = 2083.8778

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss (46)m = 0.15 x (45)m	32.4239	28.5305	29.9758	25.5908	24.2804	21.3088	20.6301	21.7777	22.3772	25.6323	28.0820	31.9723	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(64)

Total per year (kWh/year) = Sum(64)m = 2401.2088 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	71.8730	63.2426	66.4464	56.7263	53.8215	47.2344	45.7301	48.2738	49.6027	56.8182	62.2485	70.8719	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	26.8471	23.8453	19.3923	14.6812	10.9744	9.2651	10.0112	13.0130	17.4660	22.1771	25.8839	27.5932	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	341.6476	345.1929	336.2590	317.2398	293.2316	270.6672	255.5928	252.0475	260.9814	280.0006	304.0089	326.5732	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	52.8175	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	-101.8144	(71)
Water heating gains (Table 5)													
	96.6034	94.1110	89.3097	78.7865	72.3408	65.6034	61.4652	64.8842	68.8926	76.3685	86.4562	95.2580	(72)
Total internal gains													
	568.8229	566.8739	548.6857	514.4323	480.2715	449.2603	430.7940	433.6694	451.0648	482.2709	520.0737	553.1492	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.7500	36.7938	0.3300	0.0000	0.7700	72.4572	(77)
Southwest	5.1100	36.7938	0.3300	0.0000	0.7700	47.7750	(79)
Northwest	2.4700	11.2829	0.3300	0.0000	0.7700	7.0815	(81)
Northeast	11.4100	11.2829	0.3100	0.0000	0.7700	30.7298	(75)

Solar gains	158.0435	281.7659	418.8844	574.9346	695.0126	712.4365	677.5222	584.5064	472.3843	320.4061	191.5869	133.7723	(83)
Total gains	726.8664	848.6398	967.5702	1089.3669	1175.2841	1161.6968	1108.3162	1018.1758	923.4491	802.6769	711.6605	686.9215	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.1299	56.2582	56.3871	57.0406	57.1731	57.8451	57.8451	57.9814	57.5744	57.1731	56.9087	56.6467	
alpha	4.7420	4.7505	4.7591	4.8027	4.8115	4.8563	4.8563	4.8654	4.8383	4.8115	4.7939	4.7764	
util living area													
	0.9897	0.9781	0.9484	0.8682	0.7183	0.5303	0.3891	0.4398	0.6863	0.9152	0.9801	0.9920	(86)
MIT	19.7435	19.9682	20.2933	20.6589	20.8917	20.9802	20.9964	20.9936	20.9352	20.6087	20.1031	19.6991	(87)
Th 2	19.9193	19.9215	19.9237	19.9347	19.9369	19.9479	19.9479	19.9501	19.9435	19.9369	19.9325	19.9281	(88)
util rest of house													
	0.9865	0.9715	0.9333	0.8331	0.6565	0.4487	0.2974	0.3419	0.6010	0.8834	0.9730	0.9895	(89)
MIT 2	18.4843	18.7688	19.1724	19.6099	19.8531	19.9374	19.9468	19.9480	19.9034	19.5682	18.9502	18.4342	(90)
Living area fraction									fLA = Living area / (4) =			0.3070	(91)
MIT	18.8709	19.1370	19.5165	19.9319	20.1720	20.2575	20.2690	20.2690	20.2201	19.8876	19.3041	18.8225	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8709	19.1370	19.5165	19.9319	20.1720	20.2575	20.2690	20.2690	20.2201	19.8876	19.3041	18.8225	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9823	0.9654	0.9264	0.8330	0.6709	0.4732	0.3256	0.3720	0.6246	0.8817	0.9675	0.9859	(94)
Useful gains	713.9980	819.2575	896.3741	907.4677	788.5162	549.7693	360.8926	378.7918	576.7957	707.7158	688.5126	677.2163	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1481.3760	1444.1318	1317.3138	1103.6787	845.6034	558.1310	361.9576	380.7890	606.6063	927.0185	1223.7752	1473.0668	(97)
Space heating kWh													
	570.9292	419.9155	313.1791	141.2719	42.4728	0.0000	0.0000	0.0000	0.0000	163.1612	385.3891	592.1128	(98a)
Space heating requirement - total per year (kWh/year)												2628.4317	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	570.9292	419.9155	313.1791	141.2719	42.4728	0.0000	0.0000	0.0000	0.0000	163.1612	385.3891	592.1128	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2628.4317	
Space heating per m2											(98c) / (4) =	31.0469	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	570.9292	419.9155	313.1791	141.2719	42.4728	0.0000	0.0000	0.0000	0.0000	163.1612	385.3891	592.1128	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	570.9292	419.9155	313.1791	141.2719	42.4728	0.0000	0.0000	0.0000	0.0000	163.1612	385.3891	592.1128	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating

Water heating requirement

	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001 (64)
Efficiency of water heater												324.5200 (216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200 (217)
Fuel for water heating, kWh/month												
	74.9139	66.1119	69.8848	60.6087	58.1846	51.8120	50.6858	53.0432	54.0069	60.9618	65.7264	73.9862 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	18.5689	16.7719	18.5689	17.9699	18.5689	17.9699	18.5689	18.5689	17.9699	18.5689	17.9699	18.5689 (231)
Lighting	23.4991	18.8518	16.9740	12.4359	9.6058	7.8480	8.7628	11.3902	14.7947	19.4114	21.9252	24.1522 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2628.4317 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	739.9263 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)	
mechanical ventilation fans (SFP = 0.7560)	218.6341 (230a)
Total electricity for the above, kWh/year	218.6341 (231)
Electricity for lighting (calculated in Appendix L)	189.6511 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3776.6432 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2628.4317	16.4900	433.4284	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	739.9263	16.4900	122.0138	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	218.6341	16.4900	36.0528	(249)
Energy for lighting	189.6511	16.4900	31.2735	(250)
Additional standing charges			0.0000	(251)
Total energy cost			622.7685	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.7291 (257)
SAP value		71.9711
SAP rating (Section 12)		72 (258)
SAP band		C

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2628.4317	0.1563	410.8707	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	739.9263	0.1412	104.4772	(264)
Space and water heating			515.3479	(265)
Pumps, fans and electric keep-hot	218.6341	0.1387	30.3272	(267)
Energy for lighting	189.6511	0.1443	27.3725	(268)
Total CO2, kg/year			573.0476	(272)
CO2 emissions per m2			6.7700	(273)
EI value			94.0777	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	84.6600 (1b)	x	2.8000 (2b)	=	237.0480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.0480	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7900	(17)
Infiltration rate		0.1395	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1186	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1275	0.1215	0.1215	0.1126	0.1156	0.1008	0.1008	0.0978	0.1008	0.1126	0.1097	0.1186	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	71.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2715	0.2655	0.2655	0.2566	0.2596	0.2448	0.2448	0.2418	0.2448	0.2566	0.2537	0.2626	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window-GBY			15.3300	1.1450	17.5534			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Brickwork	98.1900	26.7400	71.4500	0.2100	15.0045	110.0000	7859.5003	(29a)
Communal Wall	28.1300	2.1500	25.9800	0.2200	5.7156	110.0000	2857.7999	(29a)
Lift Shaft Wall	8.9800		8.9800	0.1600	1.4368	110.0000	987.7999	(29a)
Stairwell Wall	7.4800		7.4800	0.2200	1.6456	110.0000	822.8000	(29a)
Cold Roof	84.6600		84.6600	0.0900	7.6194	9.0000	761.9400	(30)
Total net area of external elements Aum(A, m2)			227.4400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	65.6551			(33)
Main dwelling								
Party Floor 1			84.6600			70.0000	5926.2000	(32d)
Internal Wall 1			147.5100			9.0000	1327.5900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 20543.6301 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.6604 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	41.7200	0.0380	1.5854
E18 Party wall between dwellings	11.4000	0.0380	0.4332
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E16 Corner (normal)	22.8100	0.0540	1.2317
E10 Eaves (insulation at ceiling level)	40.6600	0.0630	2.5616
E2 Other lintels (including other steel lintels)	12.5600	0.0500	0.6280
E4 Jamb	42.6000	0.0160	0.6816
E12 Gable (insulation at ceiling level)	9.8300	0.0980	0.9633
E5 Ground floor (normal)	42.1100	0.1120	4.7163
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0970	-0.7712

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.9210 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 78.5761 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.2358	20.7720	20.7720	20.0764	20.3083	19.1488	19.1488	18.9169	19.1488	20.0764	19.8445	20.5402	(38)
Heat transfer coeff	99.8120	99.3482	99.3482	98.6525	98.8844	97.7249	97.7249	97.4931	97.7249	98.6525	98.4206	99.1163	(39)
Average = Sum(39)m / 12 =												98.5752	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1790	1.1735	1.1735	1.1653	1.1680	1.1543	1.1543	1.1516	1.1543	1.1653	1.1625	1.1708	(40)
HLP (average)												1.1644	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5454 (42)

Hot water usage for mixer showers

66.8971	65.8917	64.4268	61.6238	59.5553	57.2485	55.9374	57.3912	58.9850	61.4617	64.3249	66.6407	(42a)

Hot water usage for baths
28.8911 28.4621 27.8578 26.7438 25.9095 24.9845 24.4849 25.0849 25.7382 26.7280 27.8650 28.7935 (42b)
Hot water usage for other uses
40.6970 39.2171 37.7373 36.2574 34.7775 33.2976 33.2976 34.7775 36.2574 37.7373 39.2171 40.6970 (42c)
Average daily hot water use (litres/day) 125.4608 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	136.4852	133.5709	130.0219	124.6249	120.2423	115.5306	113.7198	117.2536	120.9805	125.9270	131.4070	136.1313	(44)
Energy conte	216.1593	190.2032	199.8388	170.6053	161.8693	142.0584	137.5343	145.1844	149.1810	170.8817	187.2134	213.1487	(45)
Energy content (annual)										Total = Sum(45)m =		2083.8778	

Distribution loss (46)m = 0.15 x (45)m
32.4239 28.5305 29.9758 25.5908 24.2804 21.3088 20.6301 21.7777 22.3772 25.6323 28.0820 31.9723 (46)
Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month
243.1107 214.5464 226.7902 196.6873 188.8207 168.1404 164.4857 172.1358 175.2630 197.8331 213.2954 240.1001 (62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h
243.1107 214.5464 226.7902 196.6873 188.8207 168.1404 164.4857 172.1358 175.2630 197.8331 213.2954 240.1001 (64)
Total per year (kWh/year) = Sum(64)m = 2401.2088 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
71.8730 63.2426 66.4464 56.7263 53.8215 47.2344 45.7301 48.2738 49.6027 56.8182 62.2485 70.8719 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	152.7216	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
26.8471 23.8453 19.3923 14.6812 10.9744 9.2651 10.0112 13.0130 17.4660 22.1771 25.8839 27.5932 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
341.6476 345.1929 336.2590 317.2398 293.2316 270.6672 255.5928 252.0475 260.9814 280.0006 304.0089 326.5732 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.8175 52.8175 52.8175 52.8175 52.8175 52.8175 52.8175 52.8175 52.8175 52.8175 52.8175 52.8175 (69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)
-101.8144 -101.8144 -101.8144 -101.8144 -101.8144 -101.8144 -101.8144 -101.8144 -101.8144 -101.8144 -101.8144 -101.8144 (71)
Water heating gains (Table 5)
96.6034 94.1110 89.3097 78.7865 72.3408 65.6034 61.4652 64.8842 68.8926 76.3685 86.4562 95.2580 (72)
Total internal gains
568.8229 566.8739 548.6857 514.4323 480.2715 449.2603 430.7940 433.6694 451.0648 482.2709 520.0737 553.1492 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.7500	43.0593	0.3300	0.0000	0.7700	84.7956	(77)
Southwest	5.1100	43.0593	0.3300	0.0000	0.7700	55.9104	(79)
Northwest	2.4700	13.7804	0.3300	0.0000	0.7700	8.6490	(81)
Northeast	11.4100	13.7804	0.3100	0.0000	0.7700	37.5319	(75)

Solar gains	186.8868	291.9590	433.2167	607.4265	718.0183	779.4121	733.5887	647.2386	522.1397	356.9870	223.3337	159.0047	(83)
Total gains	755.7097	858.8330	981.9024	1121.8588	1198.2898	1228.6724	1164.3827	1080.9080	973.2044	839.2579	743.4074	712.1539	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.1731	57.4400	57.4400	57.8451	57.7094	58.3941	58.3941	58.5330	58.3941	57.8451	57.9814	57.5744	
alpha	4.8115	4.8293	4.8293	4.8563	4.8473	4.8929	4.8929	4.9022	4.8929	4.8563	4.8654	4.8383	
util living area	0.9850	0.9714	0.9307	0.8191	0.6337	0.4103	0.2766	0.3060	0.5814	0.8716	0.9689	0.9881	(86)
MIT	19.9136	20.1149	20.4357	20.7723	20.9462	20.9948	20.9994	20.9991	20.9734	20.7341	20.2768	19.8737	(87)
Th 2	19.9369	19.9413	19.9413	19.9479	19.9457	19.9567	19.9567	19.9589	19.9567	19.9479	19.9501	19.9435	(88)
util rest of house	0.9804	0.9627	0.9106	0.7742	0.5631	0.3296	0.1894	0.2127	0.4894	0.8263	0.9576	0.9844	(89)
MIT 2	18.7125	18.9674	19.3586	19.7444	19.9092	19.9547	19.9566	19.9588	19.9432	19.7158	19.1797	18.6672	(90)
Living area fraction									fLA = Living area / (4) =			0.3070	(91)
MIT	19.0813	19.3197	19.6892	20.0599	20.2276	20.2740	20.2768	20.2781	20.2594	20.0284	19.5165	19.0376	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0813	19.3197	19.6892	20.0599	20.2276	20.2740	20.2768	20.2781	20.2594	20.0284	19.5165	19.0376	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9753	0.9562	0.9049	0.7794	0.5827	0.3544	0.2162	0.2414	0.5169	0.8303	0.9517	0.9799	(94)
Useful gains	737.0688	821.2523	888.5693	874.3887	698.1853	435.4239	251.7040	260.9134	503.0547	696.8155	707.5219	697.8728	(95)

Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1395.4966	1353.0886	1220.9143	1002.3021	724.5840	437.2230	251.8140	261.1006	513.9782	841.3505	1133.4622	1381.4440	(97)
Space heating kWh	489.8702	357.3940	247.2647	92.0976	19.6407	0.0000	0.0000	0.0000	0.0000	107.5340	306.6770	508.5769	(98a)
Space heating requirement - total per year (kWh/year)												2129.0552	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	489.8702	357.3940	247.2647	92.0976	19.6407	0.0000	0.0000	0.0000	0.0000	107.5340	306.6770	508.5769	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2129.0552	
Space heating per m2											(98c) / (4) =	25.1483	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	489.8702	357.3940	247.2647	92.0976	19.6407	0.0000	0.0000	0.0000	0.0000	107.5340	306.6770	508.5769	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	489.8702	357.3940	247.2647	92.0976	19.6407	0.0000	0.0000	0.0000	0.0000	107.5340	306.6770	508.5769	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	243.1107	214.5464	226.7902	196.6873	188.8207	168.1404	164.4857	172.1358	175.2630	197.8331	213.2954	240.1001	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	74.9139	66.1119	69.8848	60.6087	58.1846	51.8120	50.6858	53.0432	54.0069	60.9618	65.7264	73.9862	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	18.5689	16.7719	18.5689	17.9699	18.5689	17.9699	18.5689	18.5689	17.9699	18.5689	17.9699	18.5689	(231)
Lighting	23.4991	18.8518	16.9740	12.4359	9.6058	7.8480	8.7628	11.3902	14.7947	19.4114	21.9252	24.1522	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2129.0552	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												739.9263	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)													
mechanical ventilation fans (SFP = 0.7560)												218.6341	(230a)
Total electricity for the above, kWh/year												218.6341	(231)
Electricity for lighting (calculated in Appendix L)												189.6511	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3277.2667	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2129.0552	27.6700	589.1096	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	739.9263	27.6700	204.7376	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	218.6341	27.6700	60.4961	(249)
Energy for lighting	189.6511	27.6700	52.4765	(250)
Additional standing charges			0.0000	(251)
Total energy cost			906.8197	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2129.0552	0.1571	334.4568	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	739.9263	0.1412	104.4772	(264)
Space and water heating			438.9340	(265)
Pumps, fans and electric keep-hot	218.6341	0.1387	30.3272	(267)
Energy for lighting	189.6511	0.1443	27.3725	(268)
Total CO2, kg/year			496.6337	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2129.0552	1.5816	3367.2182	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	739.9263	1.5221	1126.2559	(278)
Space and water heating			4493.4741	(279)
Pumps, fans and electric keep-hot	218.6341	1.5128	330.7497	(281)
Energy for lighting	189.6511	1.5338	290.8932	(282)
Total Primary energy kWh/year			5115.1170	(286)

Summary for Input Data

Plot Reference	P-07	**Issued on Date**	24/04/2026
Assessment Reference	P-07-1B	**Plot Type Ref**	P-07
Plot Address	P-07, Carter's Site, Reading	**SAP Version**	10.2

SAP Rating	78 C	**DER**	6.77	**TER**	16.79
Environmental	95 A	**% DER < TER**			59.68
CO_2 Emissions (t/year)	0.29	**DFEE**	47.50	**TFEE**	44.92
Compliance Check	See BREL	**% DFEE < TFEE**			-5.74
% DPER < TPER	22.22	**DPER**	69.66	**TPER**	89.55

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	300.54	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	24.50 m	51.86 m²	2.55 m

8.0 Living Area	23.31	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	52.74	33.30	0.00	None	19.44	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	17.72	17.72	0.50	Stairwell Access Corridor 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	17.41	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	88.60

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	51.86

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)

Summary for Input Data

Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	51.86

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Brickwork	South	2.06	
Patio Door	Window-Red	Brickwork	East	6.69	
East	Window-Red	Brickwork	East	5.06	
North	Window	Brickwork	North	5.62	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	24.50	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	8.55	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.85	-0.10	-0.10	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	8.03	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	28.83	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes
E18 Party wall between dwellings	Gov Approved Scheme	2.85	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	6.06	0.11	0.11	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	6.06	0.00	0.00		No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No

Y-value	0.05	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0

Summary for Input Data

elmhurst energy

Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

Summary for Input Data

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-07	**Issued on Date**	24/04/2026
Assessment Reference	P-07-1B	**Plot Type Ref**	P-07
Plot Address	P-07, Carter's Site, Reading	**SAP Version**	10.2

SAP Rating	78 C	**DER**	6.77	**TER**	16.79
Environmental	95 A	**% DER < TER**			59.68
CO_2 Emissions (t/year)	0.29	**DFEE**	47.50	**TFEE**	44.92
Compliance Check	See BREL	**% DFEE < TFEE**			-5.74
% DPER < TPER	22.22	**DPER**	69.66	**TPER**	89.55

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8600	(1b)	x 2.5500	(2b) =	132.2430	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.2430	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			5.6200	1.1450	6.4351			(27)
Window-Red			11.7500	1.2357	14.5200			(27)
Ground Floor			51.8600	0.1200	6.2232	110.0000	5704.6000	(28a)
Brickwork	52.7400	19.4300	33.3100	0.2100	6.9951	110.0000	3664.1002	(29a)
Communal Wall	17.7200		17.7200	0.2200	3.8984	110.0000	1949.1999	(29a)
Total net area of external elements Aum(A, m2)			122.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.5438			(33)
Main dwelling								
Party Wall 1			17.4100	0.0000	0.0000	110.0000	1915.1000	(32)
Party Ceiling 1			51.8600			30.0000	1555.8000	(32b)
Internal Wall 1			88.6000			9.0000	797.4000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15586.2001	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							300.5438	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
	E16 Corner (normal)	8.5500	0.0540	0.4617
	E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
	E2 Other lintels (including other steel lintels)	8.0300	0.0500	0.4015
	E4 Jamb	28.8300	0.0160	0.4613
	E5 Ground floor (normal)	24.5000	0.1120	2.7440
	E18 Party wall between dwellings	2.8500	0.0380	0.1083
	P1 Party wall - Ground floor	6.0600	0.1080	0.6545
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
	E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5742 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.1179 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0293	12.8902	12.7511	12.0556	11.9165	11.2210	11.2210	11.0819	11.4992	11.9165	12.1947	12.4729	(38)
Heat transfer coeff	59.1473	59.0082	58.8691	58.1735	58.0344	57.3389	57.3389	57.1998	57.6171	58.0344	58.3126	58.5908	(39)

Average = Sum(39)m / 12 = 58.1388

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1405	1.1378	1.1352	1.1217	1.1191	1.1056	1.1056	1.1030	1.1110	1.1191	1.1244	1.1298	(40)
HLP (average)												1.1211	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7449 (42)

Hot water usage for mixer showers

53.4764	52.6728	51.5017	49.2611	47.6075	45.7635	44.7154	45.8776	47.1516	49.1315	51.4203	53.2715	(42a)

Hot water usage for baths

23.1198	22.7765	22.2930	21.4014	20.7338	19.9936	19.5938	20.0739	20.5967	21.3888	22.2987	23.0417	(42b)

Hot water usage for other uses

32.4999	31.3181	30.1363	28.9545	27.7727	26.5909	26.5909	27.7727	28.9545	30.1363	31.3181	32.4999	(42c)

Average daily hot water use (litres/day) 100.2846 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0962	106.7674	103.9310	99.6170	96.1141	92.3480	90.9000	93.7242	96.7028	100.6566	105.0371	108.8131	(44)
Energy conte	172.7817	152.0353	159.7380	136.3707	129.3880	113.5527	109.9357	116.0502	119.2442	136.5901	149.6446	170.3751	(45)
Energy content (annual)										Total = Sum(45)m =		1665.7062	
Distribution loss (46)m = 0.15 x (45)m	25.9173	22.8053	23.9607	20.4556	19.4082	17.0329	16.4904	17.4075	17.8866	20.4885	22.4467	25.5563	(46)

Water storage loss (or HIU loss):

Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

PV diverter / Solar input / FGHRS

Output from w/h

202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)

Total per year (kWh/year) = Sum(64)m = 2010.6312 (64)

12Total per year (kWh/year) 2011 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.4499	50.5517	53.1129	45.3432	43.0215	37.7563	36.5536	38.5867	39.6487	45.4162	49.7568	56.6497	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6982	84.9159	76.6982	79.2548	76.6982	79.2548	76.6982	76.6982	79.2548	76.6982	79.2548	76.6982	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.0628	153.6407	149.6644	141.1992	130.5134	120.4703	113.7609	112.1830	116.1593	124.6245	135.3103	145.3534	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	(71)
Water heating gains (Table 5)	77.2176	75.2258	71.3883	62.9767	57.8246	52.4392	49.1312	51.8638	55.0677	61.0433	69.1067	76.1421	(72)
Total internal gains	355.1527	362.9565	346.9250	332.6048	314.2104	301.3385	288.7645	289.9191	299.6559	311.5401	332.8459	347.3678	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.6200	10.6334	0.3300	0.0000	0.7700	15.1849	(74)
East	11.7500	19.6403	0.3100	0.0000	0.7700	55.0855	(76)

Solar gains	70.2705	136.7782	226.7744	338.0259	423.8911	438.9269	415.7732	350.1460	265.6851	162.4087	87.4178	57.9586	(83)
Total gains	425.4232	499.7347	573.6994	670.6307	738.1015	740.2654	704.5376	640.0651	565.3410	473.9488	420.2636	405.3264	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.1987	73.3712	73.5446	74.4239	74.6023	75.5072	75.5072	75.6908	75.1426	74.6023	74.2463	73.8938	
alpha	5.8799	5.8914	5.9030	5.9616	5.9735	6.0338	6.0338	6.0461	6.0095	5.9735	5.9498	5.9263	
util living area	0.9960	0.9891	0.9664	0.8762	0.6971	0.4921	0.3576	0.4100	0.6757	0.9378	0.9902	0.9969	(86)
MIT	19.9932	20.1862	20.4656	20.7919	20.9549	20.9952	20.9994	20.9987	20.9721	20.7151	20.2943	19.9626	(87)
Th 2	19.9679	19.9701	19.9722	19.9831	19.9853	19.9962	19.9962	19.9984	19.9918	19.9853	19.9809	19.9766	(88)
util rest of house	0.9944	0.9850	0.9542	0.8390	0.6330	0.4167	0.2763	0.3213	0.5890	0.9089	0.9858	0.9957	(89)
MIT 2	18.8143	19.0604	19.4091	19.7945	19.9539	19.9941	19.9961	19.9981	19.9769	19.7235	19.2076	18.7819	(90)
Living area fraction										fLA = Living area / (4) =		0.4495	(91)
MIT	19.3442	19.5664	19.8840	20.2428	20.4038	20.4440	20.4471	20.4478	20.4242	20.1692	19.6960	19.3126	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3442	19.5664	19.8840	20.2428	20.4038	20.4440	20.4471	20.4478	20.4242	20.1692	19.6960	19.3126	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9830	0.9530	0.8493	0.6602	0.4506	0.3129	0.3612	0.6274	0.9150	0.9842	0.9947	(94)
Useful gains	422.5077	491.2325	546.7082	569.5827	487.3135	333.5488	220.4489	231.2194	354.6899	433.6517	413.6386	403.1746	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	889.8250	865.4396	787.9013	659.8506	505.1224	335.0907	220.5861	231.5356	364.3836	555.3441	734.5078	885.4586	(97)
Space heating kWh	347.6841	251.4671	179.4477	64.9929	13.2499	0.0000	0.0000	0.0000	0.0000	90.5391	231.0259	358.8193	(98a)
Space heating requirement - total per year (kWh/year)												1537.2259	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.6841	251.4671	179.4477	64.9929	13.2499	0.0000	0.0000	0.0000	0.0000	90.5391	231.0259	358.8193	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1537.2259	
Space heating per m2											(98c) / (4) =	29.6418	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	347.6841	251.4671	179.4477	64.9929	13.2499	0.0000	0.0000	0.0000	0.0000	90.5391	231.0259	358.8193	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	347.6841	251.4671	179.4477	64.9929	13.2499	0.0000	0.0000	0.0000	0.0000	90.5391	231.0259	358.8193	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8740	49.3538	52.2674	45.5451	43.8757	39.2359	38.4972	40.1878	40.8097	45.8670	49.2153	55.2086	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0502	7.2712	8.0502	7.7906	8.0502	7.7906	8.0502	8.0502	7.7906	8.0502	7.7906	8.0502	(231)
Lighting	15.6106	12.5234	11.2760	8.2613	6.3812	5.2135	5.8212	7.5666	9.8282	12.8952	14.5651	16.0445	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1537.2259	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.9374	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.7852	(230a)
Total electricity for the above, kWh/year	94.7852	(231)
Electricity for lighting (calculated in Appendix L)	125.9868	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2313.9354	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1537.2259	0.1568	241.0915	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.9374	0.1411	78.4353	(264)
Space and water heating			319.5267	(265)
Pumps, fans and electric keep-hot	94.7852	0.1387	13.1479	(267)
Energy for lighting	125.9868	0.1443	18.1838	(268)
Total CO2, kg/year			350.8584	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.7700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1537.2259	1.5806	2429.7479	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.9374	1.5217	845.9677	(278)
Space and water heating			3275.7157	(279)
Pumps, fans and electric keep-hot	94.7852	1.5128	143.3910	(281)
Energy for lighting	125.9868	1.5338	193.2428	(282)
Total Primary energy kWh/year			3612.3495	(286)
Dwelling Primary energy Rate (DPER)			69.6600	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8600	(1b)	x 2.5500	(2b) =	132.2430	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.2430	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1512	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4012	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3411	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4348	0.4263	0.4178	0.3752	0.3666	0.3240	0.3240	0.3155	0.3411	0.3666	0.3837	0.4007	(22b)
Effective ac	0.5945	0.5909	0.5873	0.5704	0.5672	0.5525	0.5525	0.5498	0.5582	0.5672	0.5736	0.5803	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.9100	1.1450	12.4924			(27)
Ground Floor			51.8600	0.1300	6.7418			(28a)
Brickwork	52.7400	12.9700	39.7700	0.1800	7.1586			(29a)
Communal Wall	17.7200		17.7200	0.1800	3.1896			(29a)
Total net area of external elements Aum(A, m2)			122.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6424			(33)
Main dwelling								
Party Wall 1			17.4100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 300.5438 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0700	1.7150
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E2 Other lintels (including other steel lintels)	8.0300	0.0500	0.4015
E4 Jamb	28.8300	0.0500	1.4415
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P1 Party wall - Ground floor	6.0600	0.0800	0.4848
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8178 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.4602 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9460	25.7858	25.6287	24.8911	24.7531	24.1107	24.1107	23.9917	24.3581	24.7531	25.0323	25.3242	(38)
Heat transfer coeff	66.4061	66.2459	66.0889	65.3513	65.2133	64.5708	64.5708	64.4519	64.8183	65.2133	65.4924	65.7843	(39)

Average = Sum(39)m / 12 = 65.3506

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2805	1.2774	1.2744	1.2601	1.2575	1.2451	1.2451	1.2428	1.2499	1.2575	1.2629	1.2685	(40)
HLP (average)												1.2601	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7449 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.4764	52.6728	51.5017	49.2611	47.6075	45.7635	44.7154	45.8776	47.1516	49.1315	51.4203	53.2715	(42a)
Hot water usage for baths	23.1198	22.7765	22.2930	21.4014	20.7338	19.9936	19.5938	20.0739	20.5967	21.3888	22.2987	23.0417	(42b)
Hot water usage for other uses	32.4999	31.3181	30.1363	28.9545	27.7727	26.5909	26.5909	27.7727	28.9545	30.1363	31.3181	32.4999	(42c)

Average daily hot water use (litres/day) 100.2846 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0962	106.7674	103.9310	99.6170	96.1141	92.3480	90.9000	93.7242	96.7028	100.6566	105.0371	108.8131	(44)
Energy conte	172.7817	152.0353	159.7380	136.3707	129.3880	113.5527	109.9357	116.0502	119.2442	136.5901	149.6446	170.3751	(45)
Energy content (annual)										Total = Sum(45)m =		1665.7062	
Distribution loss (46)m = 0.15 x (45)m	25.9173	22.8053	23.9607	20.4556	19.4082	17.0329	16.4904	17.4075	17.8866	20.4885	22.4467	25.5563	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	219.3766	194.1210	206.3329	181.4625	175.9829	158.6445	156.5306	162.6451	164.3361	183.1850	194.7364	216.9700	(62)
WWHRS	-24.4472	-21.6213	-22.6406	-18.7473	-17.4718	-14.9507	-14.0139	-14.9024	-15.4686	-18.2358	-20.6589	-23.9945	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.9294	172.4997	183.6923	162.7152	158.5111	143.6938	142.5167	147.7426	148.8675	164.9492	174.0775	192.9755	(64)
										Total per year (kWh/year) = Sum(64)m =		1987.1705	(64)
12Total per year (kWh/year)												1987	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	94.7258	84.2203	90.3888	81.4167	80.2974	73.8297	73.8296	75.8626	75.7222	82.6921	85.8303	93.9256	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8991	85.1382	76.8991	79.4624	76.8991	79.4624	76.8991	76.8991	79.4624	76.8991	79.4624	76.8991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.0628	153.6407	149.6644	141.1992	130.5134	120.4703	113.7609	112.1830	116.1593	124.6245	135.3103	145.3534	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	(71)
Water heating gains (Table 5)												
	127.3197	125.3279	121.4903	113.0788	107.9267	102.5413	99.2333	101.9659	105.1697	111.1453	119.2087	126.2441 (72)
Total internal gains												
	408.4556	416.2809	400.2279	385.9144	367.5133	351.6481	339.0674	340.2220	349.9655	364.8430	386.1555	400.6707 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.5300	10.6334	0.6300	0.7000	0.7700	11.4715	(74)
East	7.3800	19.6403	0.6300	0.7000	0.7700	44.2971	(76)

Solar gains	55.7686	108.5771	179.9595	267.9666	335.6764	347.4009	329.1510	277.4499	210.7637	128.9189	69.3848	45.9910	(83)
Total gains	464.2242	524.8580	580.1873	653.8810	703.1896	699.0490	668.2184	617.6720	560.7291	493.7618	455.5403	446.6616	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.1973	65.3550	65.5103	66.2497	66.3899	67.0504	67.0504	67.1742	66.7944	66.3899	66.1069	65.8136	
alpha	5.3465	5.3570	5.3674	5.4166	5.4260	5.4700	5.4700	5.4783	5.4530	5.4260	5.4071	5.3876	
util living area													
	0.9945	0.9885	0.9722	0.9123	0.7758	0.5771	0.4229	0.4755	0.7363	0.9441	0.9880	0.9955	(86)
MIT	19.8695	20.0430	20.3108	20.6597	20.8932	20.9827	20.9973	20.9951	20.9397	20.6284	20.1940	19.8443	(87)
Th 2	19.8561	19.8586	19.8610	19.8722	19.8743	19.8841	19.8841	19.8859	19.8803	19.8743	19.8700	19.8656	(88)
util rest of house													
	0.9923	0.9841	0.9613	0.8803	0.7090	0.4831	0.3169	0.3628	0.6416	0.9162	0.9826	0.9937	(89)
MIT 2	18.5735	18.7949	19.1314	19.5542	19.7967	19.8762	19.8835	19.8846	19.8468	19.5315	18.9965	18.5484	(90)
Living area fraction										fLA = Living area / (4) =		0.4495	(91)
MIT	19.1560	19.3559	19.6615	20.0511	20.2896	20.3736	20.3841	20.3838	20.3380	20.0245	19.5348	19.1309	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1560	19.3559	19.6615	20.0511	20.2896	20.3736	20.3841	20.3838	20.3380	20.0245	19.5348	19.1309	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9905	0.9816	0.9590	0.8861	0.7352	0.5252	0.3647	0.4137	0.6826	0.9206	0.9805	0.9921	(94)
Useful gains	459.8202	515.1826	556.4004	579.3747	516.9640	367.1211	243.7119	255.5335	382.7621	454.5640	446.6482	443.1490	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	986.5300	957.6422	869.8304	728.7404	560.1527	372.8038	244.3443	256.7614	404.3376	614.6024	814.3842	982.2167	(97)
Space heating kWh													
	391.8721	297.3329	233.1919	107.5433	32.1324	0.0000	0.0000	0.0000	0.0000	119.0686	264.7699	401.0664	(98a)
Space heating requirement - total per year (kWh/year)												1846.9773	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	391.8721	297.3329	233.1919	107.5433	32.1324	0.0000	0.0000	0.0000	0.0000	119.0686	264.7699	401.0664	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1846.9773	
Space heating per m2											(98c) / (4) =	35.6147	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	391.8721	297.3329	233.1919	107.5433	32.1324	0.0000	0.0000	0.0000	0.0000	119.0686	264.7699	401.0664	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	424.5634	322.1374	252.6456	116.5150	34.8130	0.0000	0.0000	0.0000	0.0000	129.0017	286.8579	434.5248	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.9294	172.4997	183.6923	162.7152	158.5111	143.6938	142.5167	147.7426	148.8675	164.9492	174.0775	192.9755	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5932	85.2692	84.5960	83.1536	81.1869	79.8000	79.8000	79.8000	79.8000	83.3411	84.9975	85.6616	(217)
Fuel for water heating, kWh/month													
	227.7393	202.3002	217.1408	195.6802	195.2423	180.0674	178.5923	185.1412	186.5507	197.9205	204.8032	225.2766	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9781	12.8182	11.5414	8.4557	6.5314	5.3362	5.9582	7.7447	10.0596	13.1987	14.9079	16.4222	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0317	-20.8635	-31.6172	-37.5555	-42.2857	-40.1488	-39.6798	-36.5773	-31.4078	-24.7453	-15.8122	-12.0098	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9516	-10.6550	-21.6222	-33.1301	-44.4417	-44.8670	-44.3190	-37.2167	-26.8904	-15.4290	-6.6737	-3.8967	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2001.0588	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2396.4546	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.9525	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-640.8276	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3971.6383	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2001.0588	0.2100	420.2224	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2396.4546	0.2100	503.2555	(264)
Space and water heating			923.4778	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.9525	0.1443	18.6118	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.7347	0.1335	-46.2762	
PV Unit electricity exported	-294.0929	0.1253	-36.8578	
Total			-83.1340	(269)
Total CO2, kg/year			870.8849	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.7900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2001.0588	1.1300	2261.1965	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2396.4546	1.1300	2707.9937	(278)
Space and water heating			4969.1902	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.9525	1.5338	197.7916	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.7347	1.4932	-517.7416	
PV Unit electricity exported	-294.0929	0.4600	-135.2857	
Total			-653.0273	(283)
Total Primary energy kWh/year			4644.0553	(286)
Target Primary Energy Rate (TPER)			89.5500	(287)

Full SAP Calculation Printout

Plot Reference	P-07	**Issued on Date**	24/04/2026
Assessment Reference	P-07-1B	**Plot Type Ref**	P-07
Plot Address	P-07, Carter's Site, Reading	**SAP Version**	10.2

SAP Rating	78 C	**DER**	6.77	**TER**	16.79
Environmental	95 A	**% DER < TER**			59.68
CO_2 Emissions (t/year)	0.29	**DFEE**	47.50	**TFEE**	44.92
Compliance Check	See BREL	**% DFEE < TFEE**			-5.74
% DPER < TPER	22.22	**DPER**	69.66	**TPER**	89.55

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8600 (1b)	x	2.5500 (2b)	=	132.2430	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.2430	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1512	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3012	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2561	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3265	0.3201	0.3137	0.2817	0.2753	0.2432	0.2432	0.2368	0.2561	0.2753	0.2881	0.3009	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5533	0.5512	0.5492	0.5397	0.5379	0.5296	0.5296	0.5280	0.5328	0.5379	0.5415	0.5453	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			5.6200	1.1450	6.4351			(27)
Window-Red			11.7500	1.2357	14.5200			(27)
Ground Floor			51.8600	0.1200	6.2232	110.0000	5704.6000	(28a)
Brickwork	52.7400	19.4300	33.3100	0.2100	6.9951	110.0000	3664.1002	(29a)
Communal Wall	17.7200		17.7200	0.2200	3.8984	110.0000	1949.1999	(29a)
Total net area of external elements Aum(A, m2)			122.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.5438			(33)
Main dwelling								
Party Wall 1			17.4100	0.0000	0.0000	110.0000	1915.1000	(32)
Party Ceiling 1			51.8600			30.0000	1555.8000	(32b)
Internal Wall 1			88.6000			9.0000	797.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15586.2001 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		300.5438 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310

E16 Corner (normal)	8.5500	0.0540	0.4617	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765	
E2 Other lintels (including other steel lintels)	8.0300	0.0500	0.4015	
E4 Jamb	28.8300	0.0160	0.4613	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	
E18 Party wall between dwellings	2.8500	0.0380	0.1083	
P1 Party wall - Ground floor	6.0600	0.1080	0.6545	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5742 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.1179 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.1457	24.0554	23.9669	23.5511	23.4733	23.1112	23.1112	23.0441	23.2507	23.4733	23.6307	23.7952	(38)
Heat transfer coeff	70.2636	70.1733	70.0848	69.6690	69.5912	69.2291	69.2291	69.1621	69.3686	69.5912	69.7486	69.9131	(39)

Average = Sum(39)m / 12 = 69.6687

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3549	1.3531	1.3514	1.3434	1.3419	1.3349	1.3349	1.3336	1.3376	1.3419	1.3449	1.3481	(40)
HLP (average)												1.3434	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7449 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.1198	22.7765	22.2930	21.4014	20.7338	19.9936	19.5938	20.0739	20.5967	21.3888	22.2987	23.0417	(42b)

Hot water usage for other uses

32.4999	31.3181	30.1363	28.9545	27.7727	26.5909	26.5909	27.7727	28.9545	30.1363	31.3181	32.4999	(42c)

Average daily hot water use (litres/day) 50.9811 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6198	54.0946	52.4293	50.3559	48.5065	46.5845	46.1846	47.8466	49.5512	51.5251	53.6168	55.5416	(44)
Energy conte	88.0881	77.0300	80.5818	68.9347	65.2991	57.2810	55.8563	59.2441	61.1016	69.9191	76.3870	86.9647	(45)

Energy content (annual) Total = Sum(45)m = 846.6876

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.8749	65.4755	68.4945	58.5945	55.5042	48.6889	47.4779	50.3575	51.9364	59.4312	64.9289	73.9200	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

74.8749	65.4755	68.4945	58.5945	55.5042	48.6889	47.4779	50.3575	51.9364	59.4312	64.9289	73.9200	(64)

Total per year (kWh/year) = Sum(64)m = 719.6844 (64)

12Total per year (kWh/year) 720 (64)

Electric shower(s)

42.8257	38.1581	41.6671	39.7624	40.5086	38.6412	39.9293	40.5086	39.7624	41.6671	40.8836	42.8257	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 487.1398 (64a)

Heat gains from water heating, kWh/month

29.4252	25.9084	27.5404	24.5892	24.0032	21.8325	21.8518	22.7165	22.9247	25.2746	26.4531	29.1864	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6982	84.9159	76.6982	79.2548	76.6982	79.2548	76.6982	76.6982	79.2548	76.6982	79.2548	76.6982	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.0628	153.6407	149.6644	141.1992	130.5134	120.4703	113.7609	112.1830	116.1593	124.6245	135.3103	145.3534	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	(71)
Water heating gains (Table 5)	39.5499	38.5541	37.0167	34.1517	32.2624	30.3230	29.3707	30.5329	31.8399	33.9712	36.7405	39.2291	(72)
Total internal gains	317.4850	326.2848	312.5534	303.7798	288.6481	279.2222	269.0039	268.5882	276.4281	284.4680	300.4796	310.4548	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.6200	10.6334	0.3300	0.0000	0.7700	15.1849	(74)
East	11.7500	19.6403	0.3100	0.0000	0.7700	55.0855	(76)

Solar gains	70.2705	136.7782	226.7744	338.0259	423.8911	438.9269	415.7732	350.1460	265.6851	162.4087	87.4178	57.9586	(83)
Total gains	387.7555	463.0630	539.3278	641.8057	712.5392	718.1492	684.7771	618.7342	542.1132	446.8767	387.8974	368.4133	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6180	61.6973	61.7752	62.1438	62.2133	62.5387	62.5387	62.5993	62.4130	62.2133	62.0729	61.9269	
alpha	5.1079	5.1132	5.1183	5.1429	5.1476	5.1692	5.1692	5.1733	5.1609	5.1476	5.1382	5.1285	
util living area	0.9977	0.9938	0.9813	0.9278	0.7946	0.5964	0.4411	0.5061	0.7814	0.9663	0.9946	0.9982	(86)
MIT	19.6419	19.8435	20.1587	20.5718	20.8598	20.9745	20.9955	20.9913	20.9048	20.4949	19.9906	19.6055	(87)
Th 2	19.7981	19.7995	19.8008	19.8070	19.8082	19.8136	19.8136	19.8146	19.8115	19.8082	19.8058	19.8033	(88)
util rest of house	0.9967	0.9913	0.9735	0.8990	0.7268	0.4953	0.3242	0.3801	0.6852	0.9469	0.9919	0.9975	(89)
MIT 2	18.5852	18.7865	19.0974	19.4907	19.7279	19.8046	19.8128	19.8128	19.7687	19.4316	18.9386	18.5530	(90)
Living area fraction										fLA = Living area / (4) =		0.4495	(91)
MIT	19.0601	19.2616	19.5744	19.9766	20.2367	20.3304	20.3444	20.3425	20.2793	19.9095	19.4115	19.0261	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0601	19.2616	19.5744	19.9766	20.2367	20.3304	20.3444	20.3425	20.2793	19.9095	19.4115	19.0261	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9959	0.9898	0.9716	0.9037	0.7530	0.5406	0.3770	0.4371	0.7263	0.9489	0.9907	0.9968	(94)
Useful gains	386.1564	458.3280	524.0089	580.0236	536.5176	388.2335	258.1571	270.4598	393.7327	424.0575	384.2858	367.2319	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1037.1010	1007.8008	916.3170	771.6968	594.0776	396.7126	259.2221	272.6734	428.6512	647.8616	858.7081	1036.5378	(97)
Space heating kWh	484.3028	369.2458	291.8773	138.0047	42.8246	0.0000	0.0000	0.0000	0.0000	166.5103	341.5841	497.9636	(98a)
Space heating requirement - total per year (kWh/year)												2332.3132	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	484.3028	369.2458	291.8773	138.0047	42.8246	0.0000	0.0000	0.0000	0.0000	166.5103	341.5841	497.9636	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2332.3132	
Space heating per m2											(98c) / (4) =	44.9733	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	650.7538	512.2955	525.6317	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9151	0.9566	0.9314	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	595.4986	490.0841	489.5529	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	811.9851	774.4964	698.7706	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	155.8702	211.6027	155.6580	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.9676	52.9007	38.9145	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												130.7827	(107)
Energy for space heating												44.9733	(99)
Energy for space cooling												2.5218	(108)
Total												47.4951	(109)
Fabric Energy Efficiency (DFEE)												47.5	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8600	(1b)	x 2.5500	(2b) =	132.2430	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.2430	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1512 (8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4012	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3411	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4348	0.4263	0.4178	0.3752	0.3666	0.3240	0.3240	0.3155	0.3411	0.3666	0.3837	0.4007	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5945	0.5909	0.5873	0.5704	0.5672	0.5525	0.5525	0.5498	0.5582	0.5672	0.5736	0.5803	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.9100	1.1450	12.4924			(27)
Ground Floor			51.8600	0.1300	6.7418			(28a)
Brickwork	52.7400	12.9700	39.7700	0.1800	7.1586			(29a)
Communal Wall	17.7200		17.7200	0.1800	3.1896			(29a)
Total net area of external elements Aum(A, m2)			122.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6424			(33)
Main dwelling								
Party Wall 1			17.4100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	300.5438	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0700	1.7150
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E2 Other lintels (including other steel lintels)	8.0300	0.0500	0.4015
E4 Jamb	28.8300	0.0500	1.4415
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P1 Party wall - Ground floor	6.0600	0.0800	0.4848
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.8178	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	40.4602	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9460	25.7858	25.6287	24.8911	24.7531	24.1107	24.1107	23.9917	24.3581	24.7531	25.0323	25.3242	(38)
Heat transfer coeff	66.4061	66.2459	66.0889	65.3513	65.2133	64.5708	64.5708	64.4519	64.8183	65.2133	65.4924	65.7843	(39)
Average = Sum(39)m / 12 =												65.3506	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2805	1.2774	1.2744	1.2601	1.2575	1.2451	1.2451	1.2428	1.2499	1.2575	1.2629	1.2685	(40)
HLP (average)												1.2601	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7449	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	23.1198	22.7765	22.2930	21.4014	20.7338	19.9936	19.5938	20.0739	20.5967	21.3888	22.2987	23.0417	(42b)

Hot water usage for other uses

	32.4999	31.3181	30.1363	28.9545	27.7727	26.5909	26.5909	27.7727	28.9545	30.1363	31.3181	32.4999	(42c)
Average daily hot water use (litres/day)												50.9811	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.6198	54.0946	52.4293	50.3559	48.5065	46.5845	46.1846	47.8466	49.5512	51.5251	53.6168	55.5416	(44)
Energy conte	88.0881	77.0300	80.5818	68.9347	65.2991	57.2810	55.8563	59.2441	61.1016	69.9191	76.3870	86.9647	(45)
Energy content (annual)										Total = Sum(45)m =		846.6876	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	74.8749	65.4755	68.4945	58.5945	55.5042	48.6889	47.4779	50.3575	51.9364	59.4312	64.9289	73.9200	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	74.8749	65.4755	68.4945	58.5945	55.5042	48.6889	47.4779	50.3575	51.9364	59.4312	64.9289	73.9200	(64)
										Total per year (kWh/year) = Sum(64)m =		719.6844	(64)
12Total per year (kWh/year)												720	(64)

Electric shower(s)

	42.8257	38.1581	41.6671	39.7624	40.5086	38.6412	39.9293	40.5086	39.7624	41.6671	40.8836	42.8257	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												487.1398	(64a)

Heat gains from water heating, kWh/month

	29.4252	25.9084	27.5404	24.5892	24.0032	21.8325	21.8518	22.7165	22.9247	25.2746	26.4531	29.1864	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	76.8991	85.1382	76.8991	79.4624	76.8991	79.4624	76.8991	76.8991	79.4624	76.8991	79.4624	76.8991	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	152.0628	153.6407	149.6644	141.1992	130.5134	120.4703	113.7609	112.1830	116.1593	124.6245	135.3103	145.3534	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	(71)

Water heating gains (Table 5)

	39.5499	38.5541	37.0167	34.1517	32.2624	30.3230	29.3707	30.5329	31.8399	33.9712	36.7405	39.2291	(72)

Total internal gains

	317.6859	326.5072	312.7542	303.9874	288.8490	279.4298	269.2048	268.7891	276.6357	284.6689	300.6872	310.6556	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.5300	10.6334	0.6300	0.7000	0.7700	11.4715	(74)
East	7.3800	19.6403	0.6300	0.7000	0.7700	44.2971	(76)

Solar gains	55.7686	108.5771	179.9595	267.9666	335.6764	347.4009	329.1510	277.4499	210.7637	128.9189	69.3848	45.9910	(83)
Total gains	373.4545	435.0843	492.7137	571.9539	624.5253	626.8307	598.3558	546.2390	487.3993	413.5877	370.0720	356.6466	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.1973	65.3550	65.5103	66.2497	66.3899	67.0504	67.0504	67.1742	66.7944	66.3899	66.1069	65.8136	
alpha	5.3465	5.3570	5.3674	5.4166	5.4260	5.4700	5.4700	5.4783	5.4530	5.4260	5.4071	5.3876	
util living area	0.9980	0.9951	0.9861	0.9453	0.8317	0.6346	0.4705	0.5339	0.8065	0.9722	0.9954	0.9985	(86)
MIT	19.7142	19.8930	20.1742	20.5619	20.8475	20.9728	20.9955	20.9915	20.9050	20.5160	20.0509	19.6894	(87)
Th 2	19.8561	19.8586	19.8610	19.8722	19.8743	19.8841	19.8841	19.8859	19.8803	19.8743	19.8700	19.8656	(88)
util rest of house	0.9972	0.9931	0.9802	0.9223	0.7707	0.5352	0.3536	0.4094	0.7168	0.9560	0.9932	0.9978	(89)
MIT 2	18.7025	18.8821	19.1617	19.5402	19.7835	19.8741	19.8833	19.8841	19.8360	19.5072	19.0491	18.6852	(90)
Living area fraction									fLA = Living area / (4) =			0.4495	(91)
MIT	19.1572	19.3365	19.6168	19.9994	20.2617	20.3680	20.3832	20.3818	20.3165	19.9607	19.4994	19.1365	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1572	19.3365	19.6168	19.9994	20.2617	20.3680	20.3832	20.3818	20.3165	19.9607	19.4994	19.1365	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9919	0.9786	0.9254	0.7935	0.5797	0.4065	0.4658	0.7549	0.9575	0.9922	0.9973	(94)
Useful gains	372.1637	431.5720	482.1741	529.2649	495.5543	363.3658	243.2047	254.4506	367.9575	396.0168	367.1782	355.6787	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	986.6095	956.3580	866.8732	725.3602	558.3393	372.4420	244.2840	256.6373	402.9406	610.4398	812.0670	982.5899	(97)
Space heating kWh	457.1477	352.6562	286.2161	141.1886	46.7120	0.0000	0.0000	0.0000	0.0000	159.5308	320.3199	466.4219	(98a)
Space heating requirement - total per year (kWh/year)												2230.1932	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	457.1477	352.6562	286.2161	141.1886	46.7120	0.0000	0.0000	0.0000	0.0000	159.5308	320.3199	466.4219	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2230.1932	
Space heating per m2											(98c) / (4) =	43.0041	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	606.9658	477.8241	489.8341	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9012	0.9501	0.9236	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	546.9976	453.9728	452.4158	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	705.0242	673.2687	613.8259	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	113.7792	163.1561	120.0891	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.4448	40.7890	30.0223	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.2561	(107)
Energy for space heating												43.0041	(99)
Energy for space cooling												1.9139	(108)
Total												44.9180	(109)
Fabric Energy Efficiency (TFEE)												44.9	(109)

Full SAP Calculation Printout

Plot Reference	P-07	**Issued on Date**	24/04/2026
Assessment Reference	P-07-1B	**Plot Type Ref**	P-07
Plot Address	P-07, Carter's Site, Reading	**SAP Version**	10.2

SAP Rating	78 C	**DER**	6.77	**TER**	16.79
Environmental	95 A	**% DER < TER**			59.68
CO_2 Emissions (t/year)	0.29	**DFEE**	47.50	**TFEE**	44.92
Compliance Check	See BREL	**% DFEE < TFEE**			-5.74
% DPER < TPER	22.22	**DPER**	69.66	**TPER**	89.55

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8600	(1b)	x 2.5500	(2b) =	132.2430	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.2430	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			5.6200	1.1450	6.4351			(27)
Window-Red			11.7500	1.2357	14.5200			(27)
Ground Floor			51.8600	0.1200	6.2232	110.0000	5704.6000	(28a)
Brickwork	52.7400	19.4300	33.3100	0.2100	6.9951	110.0000	3664.1002	(29a)
Communal Wall	17.7200		17.7200	0.2200	3.8984	110.0000	1949.1999	(29a)
Total net area of external elements Aum(A, m2)			122.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.5438			(33)
Main dwelling								
Party Wall 1			17.4100	0.0000	0.0000	110.0000	1915.1000	(32)
Party Ceiling 1			51.8600			30.0000	1555.8000	(32b)
Internal Wall 1			88.6000			9.0000	797.4000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15586.2001	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							300.5438	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
	E16 Corner (normal)	8.5500	0.0540	0.4617
	E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
	E2 Other lintels (including other steel lintels)	8.0300	0.0500	0.4015
	E4 Jamb	28.8300	0.0160	0.4613
	E5 Ground floor (normal)	24.5000	0.1120	2.7440
	E18 Party wall between dwellings	2.8500	0.0380	0.1083
	P1 Party wall - Ground floor	6.0600	0.1080	0.6545
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
	E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5742 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.1179 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0293	12.8902	12.7511	12.0556	11.9165	11.2210	11.2210	11.0819	11.4992	11.9165	12.1947	12.4729	(38)
Heat transfer coeff	59.1473	59.0082	58.8691	58.1735	58.0344	57.3389	57.3389	57.1998	57.6171	58.0344	58.3126	58.5908	(39)

Average = Sum(39)m / 12 = 58.1388

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1405	1.1378	1.1352	1.1217	1.1191	1.1056	1.1056	1.1030	1.1110	1.1191	1.1244	1.1298	(40)
HLP (average)												1.1211	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7449 (42)

Hot water usage for mixer showers

53.4764	52.6728	51.5017	49.2611	47.6075	45.7635	44.7154	45.8776	47.1516	49.1315	51.4203	53.2715	(42a)

Hot water usage for baths

23.1198	22.7765	22.2930	21.4014	20.7338	19.9936	19.5938	20.0739	20.5967	21.3888	22.2987	23.0417	(42b)

Hot water usage for other uses

32.4999	31.3181	30.1363	28.9545	27.7727	26.5909	26.5909	27.7727	28.9545	30.1363	31.3181	32.4999	(42c)

Average daily hot water use (litres/day) 100.2846 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0962	106.7674	103.9310	99.6170	96.1141	92.3480	90.9000	93.7242	96.7028	100.6566	105.0371	108.8131	(44)
Energy conte	172.7817	152.0353	159.7380	136.3707	129.3880	113.5527	109.9357	116.0502	119.2442	136.5901	149.6446	170.3751	(45)
Energy content (annual)										Total = Sum(45)m =		1665.7062	
Distribution loss (46)m = 0.15 x (45)m	25.9173	22.8053	23.9607	20.4556	19.4082	17.0329	16.4904	17.4075	17.8866	20.4885	22.4467	25.5563	(46)

Water storage loss (or HIU loss):

Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

PV diverter / Solar input / FGHRS

Output from w/h

202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)

Total per year (kWh/year) = Sum(64)m = 2010.6312 (64)

12Total per year (kWh/year) 2011 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.4499	50.5517	53.1129	45.3432	43.0215	37.7563	36.5536	38.5867	39.6487	45.4162	49.7568	56.6497	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6982	84.9159	76.6982	79.2548	76.6982	79.2548	76.6982	76.6982	79.2548	76.6982	79.2548	76.6982	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.0628	153.6407	149.6644	141.1992	130.5134	120.4703	113.7609	112.1830	116.1593	124.6245	135.3103	145.3534	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	(71)
Water heating gains (Table 5)	77.2176	75.2258	71.3883	62.9767	57.8246	52.4392	49.1312	51.8638	55.0677	61.0433	69.1067	76.1421	(72)
Total internal gains	355.1527	362.9565	346.9250	332.6048	314.2104	301.3385	288.7645	289.9191	299.6559	311.5401	332.8459	347.3678	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.6200	10.6334	0.3300	0.0000	0.7700	15.1849	(74)
East	11.7500	19.6403	0.3100	0.0000	0.7700	55.0855	(76)

Solar gains	70.2705	136.7782	226.7744	338.0259	423.8911	438.9269	415.7732	350.1460	265.6851	162.4087	87.4178	57.9586	(83)
Total gains	425.4232	499.7347	573.6994	670.6307	738.1015	740.2654	704.5376	640.0651	565.3410	473.9488	420.2636	405.3264	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.1987	73.3712	73.5446	74.4239	74.6023	75.5072	75.5072	75.6908	75.1426	74.6023	74.2463	73.8938	
alpha	5.8799	5.8914	5.9030	5.9616	5.9735	6.0338	6.0338	6.0461	6.0095	5.9735	5.9498	5.9263	
util living area	0.9960	0.9891	0.9664	0.8762	0.6971	0.4921	0.3576	0.4100	0.6757	0.9378	0.9902	0.9969	(86)
MIT	19.9932	20.1862	20.4656	20.7919	20.9549	20.9952	20.9994	20.9987	20.9721	20.7151	20.2943	19.9626	(87)
Th 2	19.9679	19.9701	19.9722	19.9831	19.9853	19.9962	19.9962	19.9984	19.9918	19.9853	19.9809	19.9766	(88)
util rest of house	0.9944	0.9850	0.9542	0.8390	0.6330	0.4167	0.2763	0.3213	0.5890	0.9089	0.9858	0.9957	(89)
MIT 2	18.8143	19.0604	19.4091	19.7945	19.9539	19.9941	19.9961	19.9981	19.9769	19.7235	19.2076	18.7819	(90)
Living area fraction										fLA = Living area / (4) =		0.4495	(91)
MIT	19.3442	19.5664	19.8840	20.2428	20.4038	20.4440	20.4471	20.4478	20.4242	20.1692	19.6960	19.3126	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3442	19.5664	19.8840	20.2428	20.4038	20.4440	20.4471	20.4478	20.4242	20.1692	19.6960	19.3126	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9830	0.9530	0.8493	0.6602	0.4506	0.3129	0.3612	0.6274	0.9150	0.9842	0.9947	(94)
Useful gains	422.5077	491.2325	546.7082	569.5827	487.3135	333.5488	220.4489	231.2194	354.6899	433.6517	413.6386	403.1746	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	889.8250	865.4396	787.9013	659.8506	505.1224	335.0907	220.5861	231.5356	364.3836	555.3441	734.5078	885.4586	(97)
Space heating kWh	347.6841	251.4671	179.4477	64.9929	13.2499	0.0000	0.0000	0.0000	0.0000	90.5391	231.0259	358.8193	(98a)
Space heating requirement - total per year (kWh/year)												1537.2259	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.6841	251.4671	179.4477	64.9929	13.2499	0.0000	0.0000	0.0000	0.0000	90.5391	231.0259	358.8193	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1537.2259	
Space heating per m2											(98c) / (4) =	29.6418	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	347.6841	251.4671	179.4477	64.9929	13.2499	0.0000	0.0000	0.0000	0.0000	90.5391	231.0259	358.8193	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	347.6841	251.4671	179.4477	64.9929	13.2499	0.0000	0.0000	0.0000	0.0000	90.5391	231.0259	358.8193	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8740	49.3538	52.2674	45.5451	43.8757	39.2359	38.4972	40.1878	40.8097	45.8670	49.2153	55.2086	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0502	7.2712	8.0502	7.7906	8.0502	7.7906	8.0502	8.0502	7.7906	8.0502	7.7906	8.0502	(231)
Lighting	15.6106	12.5234	11.2760	8.2613	6.3812	5.2135	5.8212	7.5666	9.8282	12.8952	14.5651	16.0445	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1537.2259	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.9374	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.7852	(230a)
Total electricity for the above, kWh/year	94.7852	(231)
Electricity for lighting (calculated in Appendix L)	125.9868	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2313.9354	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1537.2259	0.1568	241.0915	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.9374	0.1411	78.4353	(264)
Space and water heating			319.5267	(265)
Pumps, fans and electric keep-hot	94.7852	0.1387	13.1479	(267)
Energy for lighting	125.9868	0.1443	18.1838	(268)
Total CO2, kg/year			350.8584	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.7700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1537.2259	1.5806	2429.7479	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.9374	1.5217	845.9677	(278)
Space and water heating			3275.7157	(279)
Pumps, fans and electric keep-hot	94.7852	1.5128	143.3910	(281)
Energy for lighting	125.9868	1.5338	193.2428	(282)
Total Primary energy kWh/year			3612.3495	(286)
Dwelling Primary energy Rate (DPER)			69.6600	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8600	(1b)	x 2.5500	(2b) =	132.2430	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.2430	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1512	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4012	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3411	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4348	0.4263	0.4178	0.3752	0.3666	0.3240	0.3240	0.3155	0.3411	0.3666	0.3837	0.4007	(22b)
Effective ac	0.5945	0.5909	0.5873	0.5704	0.5672	0.5525	0.5525	0.5498	0.5582	0.5672	0.5736	0.5803	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.9100	1.1450	12.4924			(27)
Ground Floor			51.8600	0.1300	6.7418			(28a)
Brickwork	52.7400	12.9700	39.7700	0.1800	7.1586			(29a)
Communal Wall	17.7200		17.7200	0.1800	3.1896			(29a)
Total net area of external elements Aum(A, m2)			122.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6424			(33)
Main dwelling								
Party Wall 1			17.4100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 300.5438 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0700	1.7150
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E2 Other lintels (including other steel lintels)	8.0300	0.0500	0.4015
E4 Jamb	28.8300	0.0500	1.4415
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P1 Party wall - Ground floor	6.0600	0.0800	0.4848
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8178 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.4602 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9460	25.7858	25.6287	24.8911	24.7531	24.1107	24.1107	23.9917	24.3581	24.7531	25.0323	25.3242	(38)
Heat transfer coeff	66.4061	66.2459	66.0889	65.3513	65.2133	64.5708	64.5708	64.4519	64.8183	65.2133	65.4924	65.7843	(39)

Average = Sum(39)m / 12 = 65.3506

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2805	1.2774	1.2744	1.2601	1.2575	1.2451	1.2451	1.2428	1.2499	1.2575	1.2629	1.2685	(40)
HLP (average)												1.2601	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7449 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.4764	52.6728	51.5017	49.2611	47.6075	45.7635	44.7154	45.8776	47.1516	49.1315	51.4203	53.2715	(42a)
Hot water usage for baths	23.1198	22.7765	22.2930	21.4014	20.7338	19.9936	19.5938	20.0739	20.5967	21.3888	22.2987	23.0417	(42b)
Hot water usage for other uses	32.4999	31.3181	30.1363	28.9545	27.7727	26.5909	26.5909	27.7727	28.9545	30.1363	31.3181	32.4999	(42c)

Average daily hot water use (litres/day) 100.2846 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0962	106.7674	103.9310	99.6170	96.1141	92.3480	90.9000	93.7242	96.7028	100.6566	105.0371	108.8131	(44)
Energy conte	172.7817	152.0353	159.7380	136.3707	129.3880	113.5527	109.9357	116.0502	119.2442	136.5901	149.6446	170.3751	(45)
Energy content (annual)										Total = Sum(45)m =		1665.7062	
Distribution loss (46)m = 0.15 x (45)m	25.9173	22.8053	23.9607	20.4556	19.4082	17.0329	16.4904	17.4075	17.8866	20.4885	22.4467	25.5563	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	219.3766	194.1210	206.3329	181.4625	175.9829	158.6445	156.5306	162.6451	164.3361	183.1850	194.7364	216.9700	(62)
WWHRS	-24.4472	-21.6213	-22.6406	-18.7473	-17.4718	-14.9507	-14.0139	-14.9024	-15.4686	-18.2358	-20.6589	-23.9945	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.9294	172.4997	183.6923	162.7152	158.5111	143.6938	142.5167	147.7426	148.8675	164.9492	174.0775	192.9755	(64)
										Total per year (kWh/year) = Sum(64)m =		1987.1705	(64)
12Total per year (kWh/year)												1987	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	94.7258	84.2203	90.3888	81.4167	80.2974	73.8297	73.8296	75.8626	75.7222	82.6921	85.8303	93.9256	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	87.2470	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8991	85.1382	76.8991	79.4624	76.8991	79.4624	76.8991	76.8991	79.4624	76.8991	79.4624	76.8991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.0628	153.6407	149.6644	141.1992	130.5134	120.4703	113.7609	112.1830	116.1593	124.6245	135.3103	145.3534	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	31.7247	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	(71)
Water heating gains (Table 5)												
	127.3197	125.3279	121.4903	113.0788	107.9267	102.5413	99.2333	101.9659	105.1697	111.1453	119.2087	126.2441 (72)
Total internal gains												
	408.4556	416.2809	400.2279	385.9144	367.5133	351.6481	339.0674	340.2220	349.9655	364.8430	386.1555	400.6707 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.5300	10.6334	0.6300	0.7000	0.7700	11.4715	(74)
East	7.3800	19.6403	0.6300	0.7000	0.7700	44.2971	(76)

Solar gains	55.7686	108.5771	179.9595	267.9666	335.6764	347.4009	329.1510	277.4499	210.7637	128.9189	69.3848	45.9910	(83)
Total gains	464.2242	524.8580	580.1873	653.8810	703.1896	699.0490	668.2184	617.6720	560.7291	493.7618	455.5403	446.6616	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.1973	65.3550	65.5103	66.2497	66.3899	67.0504	67.0504	67.1742	66.7944	66.3899	66.1069	65.8136	
alpha	5.3465	5.3570	5.3674	5.4166	5.4260	5.4700	5.4700	5.4783	5.4530	5.4260	5.4071	5.3876	
util living area													
	0.9945	0.9885	0.9722	0.9123	0.7758	0.5771	0.4229	0.4755	0.7363	0.9441	0.9880	0.9955	(86)
MIT	19.8695	20.0430	20.3108	20.6597	20.8932	20.9827	20.9973	20.9951	20.9397	20.6284	20.1940	19.8443	(87)
Th 2	19.8561	19.8586	19.8610	19.8722	19.8743	19.8841	19.8841	19.8859	19.8803	19.8743	19.8700	19.8656	(88)
util rest of house													
	0.9923	0.9841	0.9613	0.8803	0.7090	0.4831	0.3169	0.3628	0.6416	0.9162	0.9826	0.9937	(89)
MIT 2	18.5735	18.7949	19.1314	19.5542	19.7967	19.8762	19.8835	19.8846	19.8468	19.5315	18.9965	18.5484	(90)
Living area fraction										fLA = Living area / (4) =		0.4495	(91)
MIT	19.1560	19.3559	19.6615	20.0511	20.2896	20.3736	20.3841	20.3838	20.3380	20.0245	19.5348	19.1309	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1560	19.3559	19.6615	20.0511	20.2896	20.3736	20.3841	20.3838	20.3380	20.0245	19.5348	19.1309	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9905	0.9816	0.9590	0.8861	0.7352	0.5252	0.3647	0.4137	0.6826	0.9206	0.9805	0.9921	(94)
Useful gains	459.8202	515.1826	556.4004	579.3747	516.9640	367.1211	243.7119	255.5335	382.7621	454.5640	446.6482	443.1490	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	986.5300	957.6422	869.8304	728.7404	560.1527	372.8038	244.3443	256.7614	404.3376	614.6024	814.3842	982.2167	(97)
Space heating kWh													
	391.8721	297.3329	233.1919	107.5433	32.1324	0.0000	0.0000	0.0000	0.0000	119.0686	264.7699	401.0664	(98a)
Space heating requirement - total per year (kWh/year)												1846.9773	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	391.8721	297.3329	233.1919	107.5433	32.1324	0.0000	0.0000	0.0000	0.0000	119.0686	264.7699	401.0664	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1846.9773	
Space heating per m2											(98c) / (4) =	35.6147	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	391.8721	297.3329	233.1919	107.5433	32.1324	0.0000	0.0000	0.0000	0.0000	119.0686	264.7699	401.0664	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	424.5634	322.1374	252.6456	116.5150	34.8130	0.0000	0.0000	0.0000	0.0000	129.0017	286.8579	434.5248	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.9294	172.4997	183.6923	162.7152	158.5111	143.6938	142.5167	147.7426	148.8675	164.9492	174.0775	192.9755	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5932	85.2692	84.5960	83.1536	81.1869	79.8000	79.8000	79.8000	79.8000	83.3411	84.9975	85.6616	(217)
Fuel for water heating, kWh/month													
	227.7393	202.3002	217.1408	195.6802	195.2423	180.0674	178.5923	185.1412	186.5507	197.9205	204.8032	225.2766	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9781	12.8182	11.5414	8.4557	6.5314	5.3362	5.9582	7.7447	10.0596	13.1987	14.9079	16.4222	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0317	-20.8635	-31.6172	-37.5555	-42.2857	-40.1488	-39.6798	-36.5773	-31.4078	-24.7453	-15.8122	-12.0098	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9516	-10.6550	-21.6222	-33.1301	-44.4417	-44.8670	-44.3190	-37.2167	-26.8904	-15.4290	-6.6737	-3.8967	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2001.0588	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2396.4546	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.9525	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-640.8276	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3971.6383	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2001.0588	0.2100	420.2224	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2396.4546	0.2100	503.2555	(264)
Space and water heating			923.4778	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.9525	0.1443	18.6118	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.7347	0.1335	-46.2762	
PV Unit electricity exported	-294.0929	0.1253	-36.8578	
Total			-83.1340	(269)
Total CO2, kg/year			870.8849	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.7900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2001.0588	1.1300	2261.1965	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2396.4546	1.1300	2707.9937	(278)
Space and water heating			4969.1902	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.9525	1.5338	197.7916	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.7347	1.4932	-517.7416	
PV Unit electricity exported	-294.0929	0.4600	-135.2857	
Total			-653.0273	(283)
Total Primary energy kWh/year			4644.0553	(286)
Target Primary Energy Rate (TPER)			89.5500	(287)

Full SAP Calculation Printout

Plot Reference	P-07	**Issued on Date**	24/04/2026
Assessment Reference	P-07-1B	**Plot Type Ref**	P-07
Plot Address	P-07, Carter's Site, Reading	**SAP Version**	10.2

SAP Rating	78 C	**DER**	6.77	**TER**	16.79
Environmental	95 A	**% DER < TER**			59.68
CO_2 Emissions (t/year)	0.29	**DFEE**	47.50	**TFEE**	44.92
Compliance Check	See BREL	**% DFEE < TFEE**			-5.74
% DPER < TPER	22.22	**DPER**	69.66	**TPER**	89.55

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8600 (1b)	x	2.5500 (2b)	=	132.2430	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.2430	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			5.6200	1.1450	6.4351			(27)
Window-Red			11.7500	1.2357	14.5200			(27)
Ground Floor			51.8600	0.1200	6.2232	110.0000	5704.6000	(28a)
Brickwork	52.7400	19.4300	33.3100	0.2100	6.9951	110.0000	3664.1002	(29a)
Communal Wall	17.7200		17.7200	0.2200	3.8984	110.0000	1949.1999	(29a)
Total net area of external elements Aum(A, m2)			122.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.5438			(33)
Main dwelling								
Party Wall 1			17.4100	0.0000	0.0000	110.0000	1915.1000	(32)
Party Ceiling 1			51.8600			30.0000	1555.8000	(32b)
Internal Wall 1			88.6000			9.0000	797.4000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15586.2001	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							300.5438	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E2 Other lintels (including other steel lintels)	8.0300	0.0500	0.4015
E4 Jamb	28.8300	0.0160	0.4613
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P1 Party wall - Ground floor	6.0600	0.1080	0.6545
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5742 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.1179 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0293	12.8902	12.7511	12.0556	11.9165	11.2210	11.2210	11.0819	11.4992	11.9165	12.1947	12.4729	(38)
Heat transfer coeff	59.1473	59.0082	58.8691	58.1735	58.0344	57.3389	57.3389	57.1998	57.6171	58.0344	58.3126	58.5908	(39)
Average = Sum(39)m / 12 =												58.1388	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1405	1.1378	1.1352	1.1217	1.1191	1.1056	1.1056	1.1030	1.1110	1.1191	1.1244	1.1298	(40)
HLP (average)												1.1211	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7449 (42)
Hot water usage for mixer showers

53.4764	52.6728	51.5017	49.2611	47.6075	45.7635	44.7154	45.8776	47.1516	49.1315	51.4203	53.2715	(42a)

Hot water usage for baths

23.1198	22.7765	22.2930	21.4014	20.7338	19.9936	19.5938	20.0739	20.5967	21.3888	22.2987	23.0417	(42b)

Hot water usage for other uses

32.4999	31.3181	30.1363	28.9545	27.7727	26.5909	26.5909	27.7727	28.9545	30.1363	31.3181	32.4999	(42c)

Average daily hot water use (litres/day) 100.2846 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0962	106.7674	103.9310	99.6170	96.1141	92.3480	90.9000	93.7242	96.7028	100.6566	105.0371	108.8131	(44)
Energy conte	172.7817	152.0353	159.7380	136.3707	129.3880	113.5527	109.9357	116.0502	119.2442	136.5901	149.6446	170.3751	(45)
Energy content (annual)										Total = Sum(45)m =		1665.7062	
Distribution loss (46)m = 0.15 x (45)m	25.9173	22.8053	23.9607	20.4556	19.4082	17.0329	16.4904	17.4075	17.8866	20.4885	22.4467	25.5563	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)
										Total per year (kWh/year) = Sum(64)m =		2010.6312	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	57.4499	50.5517	53.1129	45.3432	43.0215	37.7563	36.5536	38.5867	39.6487	45.4162	49.7568	56.6497	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8347	15.8407	12.8825	9.7529	7.2904	6.1549	6.6505	8.6446	11.6028	14.7324	17.1949	18.3304	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.9594	229.3145	223.3797	210.7451	194.7962	179.8065	169.7924	167.4373	173.3721	186.0067	201.9556	216.9453	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	(71)
Water heating gains (Table 5)	77.2176	75.2258	71.3883	62.9767	57.8246	52.4392	49.1312	51.8638	55.0677	61.0433	69.1067	76.1421	(72)
Total internal gains	404.1251	402.4944	389.7638	365.5881	342.0246	320.5140	307.6876	310.0591	322.1560	343.8958	370.3706	393.5312	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.6200	10.6334	0.3300	0.0000	0.7700	15.1849	(74)
East	11.7500	19.6403	0.3100	0.0000	0.7700	55.0855	(76)

Solar gains	70.2705	136.7782	226.7744	338.0259	423.8911	438.9269	415.7732	350.1460	265.6851	162.4087	87.4178	57.9586	(83)
Total gains	474.3956	539.2725	616.5382	703.6139	765.9157	759.4409	723.4607	660.2051	587.8410	506.3045	457.7883	451.4898	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.1987	73.3712	73.5446	74.4239	74.6023	75.5072	75.5072	75.6908	75.1426	74.6023	74.2463	73.8938	
alpha	5.8799	5.8914	5.9030	5.9616	5.9735	6.0338	6.0338	6.0461	6.0095	5.9735	5.9498	5.9263	
util living area	0.9930	0.9843	0.9545	0.8565	0.6765	0.4801	0.3483	0.3976	0.6540	0.9201	0.9852	0.9946	(86)
MIT	20.0778	20.2514	20.5264	20.8188	20.9614	20.9957	20.9995	20.9989	20.9765	20.7534	20.3566	20.0430	(87)
Th 2	19.9679	19.9701	19.9722	19.9831	19.9853	19.9962	19.9962	19.9984	19.9918	19.9853	19.9809	19.9766	(88)
util rest of house	0.9904	0.9787	0.9389	0.8164	0.6127	0.4063	0.2691	0.3116	0.5683	0.8859	0.9788	0.9926	(89)
MIT 2	18.9215	19.1418	19.4812	19.8216	19.9588	19.9943	19.9961	19.9981	19.9794	19.7644	19.2851	18.8841	(90)
Living area fraction									fLA = Living area / (4) =			0.4495	(91)
MIT	19.4412	19.6405	19.9510	20.2698	20.4094	20.4445	20.4471	20.4480	20.4276	20.2089	19.7668	19.4050	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4412	19.6405	19.9510	20.2698	20.4094	20.4445	20.4471	20.4480	20.4276	20.2089	19.7668	19.4050	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9886	0.9764	0.9385	0.8286	0.6401	0.4395	0.3047	0.3503	0.6064	0.8945	0.9771	0.9911	(94)
Useful gains	469.0076	526.5416	578.6443	582.9998	490.2538	333.7659	220.4704	231.2757	356.4467	452.8899	447.3056	447.4869	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	895.5616	869.8119	791.8466	661.4222	505.4460	335.1148	220.5888	231.5424	364.5766	557.6492	738.6317	890.8741	(97)
Space heating kWh	317.3562	230.6777	158.6225	56.4641	11.3030	0.0000	0.0000	0.0000	0.0000	77.9409	209.7548	329.8801	(98a)
Space heating requirement - total per year (kWh/year)												1391.9992	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	317.3562	230.6777	158.6225	56.4641	11.3030	0.0000	0.0000	0.0000	0.0000	77.9409	209.7548	329.8801	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1391.9992	
Space heating per m2											(98c) / (4) =	26.8415	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	317.3562	230.6777	158.6225	56.4641	11.3030	0.0000	0.0000	0.0000	0.0000	77.9409	209.7548	329.8801	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	317.3562	230.6777	158.6225	56.4641	11.3030	0.0000	0.0000	0.0000	0.0000	77.9409	209.7548	329.8801	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8740	49.3538	52.2674	45.5451	43.8757	39.2359	38.4972	40.1878	40.8097	45.8670	49.2153	55.2086	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0502	7.2712	8.0502	7.7906	8.0502	7.7906	8.0502	8.0502	7.7906	8.0502	7.7906	8.0502	(231)
Lighting	15.6106	12.5234	11.2760	8.2613	6.3812	5.2135	5.8212	7.5666	9.8282	12.8952	14.5651	16.0445	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1391.9992	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.9374	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.7852	(230a)
Total electricity for the above, kWh/year	94.7852	(231)
Electricity for lighting (calculated in Appendix L)	125.9868	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2168.7086	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1391.9992	16.4900	229.5407	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.9374	16.4900	91.6741	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.7852	16.4900	15.6301	(249)
Energy for lighting	125.9868	16.4900	20.7752	(250)
Additional standing charges			0.0000	(251)
Total energy cost			357.6201	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3292	(257)
SAP value		78.4542	
SAP rating (Section 12)		78	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1391.9992	0.1570	218.5165	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.9374	0.1411	78.4353	(264)
Space and water heating			296.9517	(265)
Pumps, fans and electric keep-hot	94.7852	0.1387	13.1479	(267)
Energy for lighting	125.9868	0.1443	18.1838	(268)
Total CO2, kg/year			328.2834	(272)
CO2 emissions per m2			6.3300	(273)
EI value			95.4584	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8600	(1b) x	2.5500	(2b) =	132.2430	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.2430	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)

Infiltration rate												0.1500	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate													
	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

Effective ac	0.2699	0.2635	0.2635	0.2539	0.2539	0.2412	0.2444	0.2380	0.2412	0.2476	0.2476	0.2571	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			5.6200	1.1450	6.4351			(27)
Window-Red			11.7500	1.2357	14.5200			(27)
Ground Floor			51.8600	0.1200	6.2232	110.0000	5704.6000	(28a)
Brickwork	52.7400	19.4300	33.3100	0.2100	6.9951	110.0000	3664.1002	(29a)
Communal Wall	17.7200		17.7200	0.2200	3.8984	110.0000	1949.1999	(29a)
Total net area of external elements Aum(A, m2)			122.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5438			(33)
Main dwelling								
Party Wall 1			17.4100	0.0000	0.0000	110.0000	1915.1000	(32)
Party Ceiling 1			51.8600			30.0000	1555.8000	(32b)
Internal Wall 1			88.6000			9.0000	797.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15586.2001	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	300.5438	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E2 Other lintels (including other steel lintels)	8.0300	0.0500	0.4015
E4 Jamb	28.8300	0.0160	0.4613
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P1 Party wall - Ground floor	6.0600	0.1080	0.6545
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.5742	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	46.1179	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.7774	11.4992	11.4992	11.0819	11.0819	10.5255	10.6646	10.3864	10.5255	10.8037	10.8037	11.2210	(38)
Heat transfer coeff	57.8953	57.6171	57.6171	57.1998	57.1998	56.6434	56.7825	56.5043	56.6434	56.9216	56.9216	57.3389	(39)
Average = Sum(39)m / 12 =												57.1071	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1164	1.1110	1.1110	1.1030	1.1030	1.0922	1.0949	1.0896	1.0922	1.0976	1.0976	1.1056	(40)
HLP (average)												1.1012	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7449	(42)
Hot water usage for mixer showers	53.4764	52.6728	51.5017	49.2611	47.6075	45.7635	44.7154	45.8776	47.1516	49.1315	51.4203	53.2715	(42a)
Hot water usage for baths	23.1198	22.7765	22.2930	21.4014	20.7338	19.9936	19.5938	20.0739	20.5967	21.3888	22.2987	23.0417	(42b)
Hot water usage for other uses	32.4999	31.3181	30.1363	28.9545	27.7727	26.5909	26.5909	27.7727	28.9545	30.1363	31.3181	32.4999	(42c)
Average daily hot water use (litres/day)												100.2846	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0962	106.7674	103.9310	99.6170	96.1141	92.3480	90.9000	93.7242	96.7028	100.6566	105.0371	108.8131	(44)
Energy conte	172.7817	152.0353	159.7380	136.3707	129.3880	113.5527	109.9357	116.0502	119.2442	136.5901	149.6446	170.3751	(45)
Energy content (annual)										Total = Sum(45)m =		1665.7062	
Distribution loss (46)m = 0.15 x (45)m	25.9173	22.8053	23.9607	20.4556	19.4082	17.0329	16.4904	17.4075	17.8866	20.4885	22.4467	25.5563	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)
										Total per year (kWh/year) = Sum(64)m =		2010.6312	(64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	57.4499	50.5517	53.1129	45.3432	43.0215	37.7563	36.5536	38.5867	39.6487	45.4162	49.7568	56.6497 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.8347	15.8407	12.8825	9.7529	7.2904	6.1549	6.6505	8.6446	11.6028	14.7324	17.1949	18.3304 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	226.9594	229.3145	223.3797	210.7451	194.7962	179.8065	169.7924	167.4373	173.3721	186.0067	201.9556	216.9453 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976 (71)

Water heating gains (Table 5)

	77.2176	75.2258	71.3883	62.9767	57.8246	52.4392	49.1312	51.8638	55.0677	61.0433	69.1067	76.1421 (72)

Total internal gains

	404.1251	402.4944	389.7638	365.5881	342.0246	320.5140	307.6876	310.0591	322.1560	343.8958	370.3706	393.5312 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.6200	11.9814	0.3300	0.0000	0.7700	17.1100	(74)
East	11.7500	22.3313	0.3100	0.0000	0.7700	62.6332	(76)

Solar gains	79.7432	139.8969	229.3048	351.9067	429.2691	475.2802	445.5109	384.2130	291.1460	177.4495	101.6857	65.0978 (83)
Total gains	483.8683	542.3912	619.0686	717.4948	771.2937	795.7942	753.1984	694.2721	613.3019	521.3453	472.0563	458.6290 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.7815	75.1426	75.1426	75.6908	75.6908	76.4343	76.2471	76.6225	76.4343	76.0607	76.0607	75.5072	
alpha	5.9854	6.0095	6.0095	6.0461	6.0461	6.0956	6.0831	6.1082	6.0956	6.0707	6.0707	6.0338	
util living area	0.9898	0.9792	0.9370	0.8007	0.5827	0.3555	0.2337	0.2604	0.5301	0.8695	0.9753	0.9921	(86)
MIT	20.2088	20.3612	20.6350	20.8915	20.9854	20.9994	21.0000	20.9999	20.9938	20.8531	20.4976	20.1804	(87)
Th 2	19.9875	19.9918	19.9918	19.9984	19.9984	20.0072	20.0050	20.0094	20.0072	20.0028	20.0028	19.9962	(88)
util rest of house	0.9859	0.9716	0.9157	0.7510	0.5142	0.2851	0.1587	0.1798	0.4422	0.8190	0.9647	0.9890	(89)
MIT 2	19.1027	19.2964	19.6269	19.9091	19.9899	20.0070	20.0050	20.0094	20.0047	19.8845	19.4774	19.0738	(90)
Living area fraction									fLA = Living area / (4) =			0.4495	(91)
MIT	19.5998	19.7750	20.0800	20.3507	20.4374	20.4531	20.4522	20.4546	20.4493	20.3199	19.9360	19.5712	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5998	19.7750	20.0800	20.3507	20.4374	20.4531	20.4522	20.4546	20.4493	20.3199	19.9360	19.5712	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9696	0.9179	0.7694	0.5447	0.3168	0.1924	0.2160	0.4818	0.8366	0.9638	0.9873	(94)
Useful gains	476.1264	525.8859	568.2197	552.0686	420.1097	252.0800	144.9155	149.9866	295.4704	436.1736	454.9576	452.8061	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	839.4730	816.7234	730.5876	597.7770	425.4161	252.2365	144.9207	149.9967	297.3374	496.3483	679.4147	829.7610	(97)
Space heating kWh	270.3298	195.4428	120.8018	32.9101	3.9479	0.0000	0.0000	0.0000	0.0000	44.7699	161.6091	280.4545	(98a)

Space heating requirement - total per year (kWh/year) 1110.2659

Solar heating kWh

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	270.3298	195.4428	120.8018	32.9101	3.9479	0.0000	0.0000	0.0000	0.0000	44.7699	161.6091	280.4545 (98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1110.2659

Space heating per m2 (98c) / (4) = 21.4089 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Fraction of main heating from main system 2 0.0000 (203)

Fraction of total heating from main system 1 1.0000 (204)

Fraction of total heating from main system 2 0.0000 (205)

Efficiency of main space heating system 1 (in %) 100.0000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	270.3298	195.4428	120.8018	32.9101	3.9479	0.0000	0.0000	0.0000	0.0000	44.7699	161.6091	280.4545	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	270.3298	195.4428	120.8018	32.9101	3.9479	0.0000	0.0000	0.0000	0.0000	44.7699	161.6091	280.4545	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)

Efficiency of water heater 361.6650 (216)

(217)m 361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)

Fuel for water heating, kWh/month

55.8740	49.3538	52.2674	45.5451	43.8757	39.2359	38.4972	40.1878	40.8097	45.8670	49.2153	55.2086	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 8.0502	7.2712	8.0502	7.7906	8.0502	7.7906	8.0502	8.0502	7.7906	8.0502	7.7906	8.0502	(231)
Lighting 15.6106	12.5234	11.2760	8.2613	6.3812	5.2135	5.8212	7.5666	9.8282	12.8952	14.5651	16.0445	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1110.2659 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 555.9374 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 94.7852 (230a)
Total electricity for the above, kWh/year 94.7852 (231)
Electricity for lighting (calculated in Appendix L) 125.9868 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1886.9753 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1110.2659	27.6700	307.2106	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.9374	27.6700	153.8279	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.7852	27.6700	26.2271	(249)
Energy for lighting	125.9868	27.6700	34.8606	(250)
Additional standing charges			0.0000	(251)
Total energy cost			522.1261	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1110.2659	0.1578	175.2503	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.9374	0.1411	78.4353	(264)
Space and water heating			253.6856	(265)
Pumps, fans and electric keep-hot	94.7852	0.1387	13.1479	(267)
Energy for lighting	125.9868	0.1443	18.1838	(268)
Total CO2, kg/year			285.0172	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1110.2659	1.5843	1759.0188	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.9374	1.5217	845.9677	(278)
Space and water heating			2604.9865	(279)
Pumps, fans and electric keep-hot	94.7852	1.5128	143.3910	(281)
Energy for lighting	125.9868	1.5338	193.2428	(282)
Total Primary energy kWh/year			2941.6203	(286)

SAP 10 EPC IMPROVEMENTS

P-07-1B

Current energy efficiency rating: C 78
Current environmental impact rating: A 95

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 78
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£522	£522	£0
Space heating	£333	£333	£0
Water heating	£154	£154	£0
Lighting	£35	£35	£0
Total cost of fuels	£522	£522	£0
Total cost of uses	£522	£522	£0
Delivered energy	36 kWh/m²	36 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8600 (1b)	x	2.5500 (2b)	=	132.2430	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.2430	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Window			5.6200	1.1450	6.4351			(27)
Window-Red			11.7500	1.2357	14.5200			(27)
Ground Floor			51.8600	0.1200	6.2232	110.0000	5704.6000	(28a)
Brickwork	52.7400	19.4300	33.3100	0.2100	6.9951	110.0000	3664.1002	(29a)
Communal Wall	17.7200		17.7200	0.2200	3.8984	110.0000	1949.1999	(29a)
Total net area of external elements Aum(A, m2)			122.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.5438			(33)
Main dwelling								
Party Wall 1			17.4100	0.0000	0.0000	110.0000	1915.1000	(32)
Party Ceiling 1			51.8600			30.0000	1555.8000	(32b)
Internal Wall 1			88.6000			9.0000	797.4000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15586.2001 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 300.5438 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E2 Other lintels (including other steel lintels)	8.0300	0.0500	0.4015
E4 Jamb	28.8300	0.0160	0.4613
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P1 Party wall - Ground floor	6.0600	0.1080	0.6545
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5742 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.1179 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0293	12.8902	12.7511	12.0556	11.9165	11.2210	11.2210	11.0819	11.4992	11.9165	12.1947	12.4729	(38)
Heat transfer coeff	59.1473	59.0082	58.8691	58.1735	58.0344	57.3389	57.3389	57.1998	57.6171	58.0344	58.3126	58.5908	(39)
Average = Sum(39)m / 12 =												58.1388	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1405	1.1378	1.1352	1.1217	1.1191	1.1056	1.1056	1.1030	1.1110	1.1191	1.1244	1.1298	(40)
HLP (average)												1.1211	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7449 (42)
Hot water usage for mixer showers

53.4764	52.6728	51.5017	49.2611	47.6075	45.7635	44.7154	45.8776	47.1516	49.1315	51.4203	53.2715	(42a)

Hot water usage for baths

23.1198	22.7765	22.2930	21.4014	20.7338	19.9936	19.5938	20.0739	20.5967	21.3888	22.2987	23.0417	(42b)

Hot water usage for other uses

32.4999	31.3181	30.1363	28.9545	27.7727	26.5909	26.5909	27.7727	28.9545	30.1363	31.3181	32.4999	(42c)

Average daily hot water use (litres/day) 100.2846 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0962	106.7674	103.9310	99.6170	96.1141	92.3480	90.9000	93.7242	96.7028	100.6566	105.0371	108.8131	(44)
Energy conte	172.7817	152.0353	159.7380	136.3707	129.3880	113.5527	109.9357	116.0502	119.2442	136.5901	149.6446	170.3751	(45)
Energy content (annual)										Total = Sum(45)m =		1665.7062	
Distribution loss (46)m = 0.15 x (45)m	25.9173	22.8053	23.9607	20.4556	19.4082	17.0329	16.4904	17.4075	17.8866	20.4885	22.4467	25.5563	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)
								Total per year (kWh/year) = Sum(64)m =				2010.6312	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	57.4499	50.5517	53.1129	45.3432	43.0215	37.7563	36.5536	38.5867	39.6487	45.4162	49.7568	56.6497	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8347	15.8407	12.8825	9.7529	7.2904	6.1549	6.6505	8.6446	11.6028	14.7324	17.1949	18.3304	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.9594	229.3145	223.3797	210.7451	194.7962	179.8065	169.7924	167.4373	173.3721	186.0067	201.9556	216.9453	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	(71)
Water heating gains (Table 5)													
	77.2176	75.2258	71.3883	62.9767	57.8246	52.4392	49.1312	51.8638	55.0677	61.0433	69.1067	76.1421	(72)
Total internal gains													
	404.1251	402.4944	389.7638	365.5881	342.0246	320.5140	307.6876	310.0591	322.1560	343.8958	370.3706	393.5312	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.6200	10.6334	0.3300	0.0000	0.7700	15.1849	(74)
East	11.7500	19.6403	0.3100	0.0000	0.7700	55.0855	(76)

Solar gains	70.2705	136.7782	226.7744	338.0259	423.8911	438.9269	415.7732	350.1460	265.6851	162.4087	87.4178	57.9586	(83)
Total gains	474.3956	539.2725	616.5382	703.6139	765.9157	759.4409	723.4607	660.2051	587.8410	506.3045	457.7883	451.4898	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.1987	73.3712	73.5446	74.4239	74.6023	75.5072	75.5072	75.6908	75.1426	74.6023	74.2463	73.8938	
alpha	5.8799	5.8914	5.9030	5.9616	5.9735	6.0338	6.0338	6.0461	6.0095	5.9735	5.9498	5.9263	
util living area													
	0.9930	0.9843	0.9545	0.8565	0.6765	0.4801	0.3483	0.3976	0.6540	0.9201	0.9852	0.9946	(86)
MIT	20.0778	20.2514	20.5264	20.8188	20.9614	20.9957	20.9995	20.9989	20.9765	20.7534	20.3566	20.0430	(87)
Th 2	19.9679	19.9701	19.9722	19.9831	19.9853	19.9962	19.9962	19.9984	19.9918	19.9853	19.9809	19.9766	(88)
util rest of house													
	0.9904	0.9787	0.9389	0.8164	0.6127	0.4063	0.2691	0.3116	0.5683	0.8859	0.9788	0.9926	(89)
MIT 2	18.9215	19.1418	19.4812	19.8216	19.9588	19.9943	19.9961	19.9981	19.9794	19.7644	19.2851	18.8841	(90)
Living area fraction									fLA = Living area / (4) =			0.4495	(91)
MIT	19.4412	19.6405	19.9510	20.2698	20.4094	20.4445	20.4471	20.4480	20.4276	20.2089	19.7668	19.4050	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4412	19.6405	19.9510	20.2698	20.4094	20.4445	20.4471	20.4480	20.4276	20.2089	19.7668	19.4050	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9886	0.9764	0.9385	0.8286	0.6401	0.4395	0.3047	0.3503	0.6064	0.8945	0.9771	0.9911	(94)
Useful gains	469.0076	526.5416	578.6443	582.9998	490.2538	333.7659	220.4704	231.2757	356.4467	452.8899	447.3056	447.4869	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	895.5616	869.8119	791.8466	661.4222	505.4460	335.1148	220.5888	231.5424	364.5766	557.6492	738.6317	890.8741	(97)
Space heating kWh													
	317.3562	230.6777	158.6225	56.4641	11.3030	0.0000	0.0000	0.0000	0.0000	77.9409	209.7548	329.8801	(98a)
Space heating requirement - total per year (kWh/year)												1391.9992	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	317.3562	230.6777	158.6225	56.4641	11.3030	0.0000	0.0000	0.0000	0.0000	77.9409	209.7548	329.8801	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1391.9992	
Space heating per m2										(98c) / (4) =		26.8415	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	317.3562	230.6777	158.6225	56.4641	11.3030	0.0000	0.0000	0.0000	0.0000	77.9409	209.7548	329.8801	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	317.3562	230.6777	158.6225	56.4641	11.3030	0.0000	0.0000	0.0000	0.0000	77.9409	209.7548	329.8801	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.8740	49.3538	52.2674	45.5451	43.8757	39.2359	38.4972	40.1878	40.8097	45.8670	49.2153	55.2086	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0502	7.2712	8.0502	7.7906	8.0502	7.7906	8.0502	8.0502	7.7906	8.0502	7.7906	8.0502	(231)
Lighting	15.6106	12.5234	11.2760	8.2613	6.3812	5.2135	5.8212	7.5666	9.8282	12.8952	14.5651	16.0445	(232)

Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1391.9992	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.9374	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.7852	(230a)
Total electricity for the above, kWh/year	94.7852	(231)
Electricity for lighting (calculated in Appendix L)	125.9868	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2168.7086	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1391.9992	16.4900	229.5407	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.9374	16.4900	91.6741	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.7852	16.4900	15.6301	(249)
Energy for lighting	125.9868	16.4900	20.7752	(250)
Additional standing charges			0.0000	(251)
Total energy cost			357.6201	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3292	(257)
SAP value		78.4542	
SAP rating (Section 12)		78	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1391.9992	0.1570	218.5165	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.9374	0.1411	78.4353	(264)
Space and water heating			296.9517	(265)
Pumps, fans and electric keep-hot	94.7852	0.1387	13.1479	(267)
Energy for lighting	125.9868	0.1443	18.1838	(268)
Total CO2, kg/year			328.2834	(272)
CO2 emissions per m2			6.3300	(273)
EI value			95.4584	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8600 (1b)	x	2.5500 (2b)	=	132.2430	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.2430	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2699	0.2635	0.2635	0.2539	0.2539	0.2412	0.2444	0.2380	0.2412	0.2476	0.2476	0.2571	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			5.6200	1.1450	6.4351			(27)
Window-Red			11.7500	1.2357	14.5200			(27)
Ground Floor			51.8600	0.1200	6.2232	110.0000	5704.6000	(28a)
Brickwork	52.7400	19.4300	33.3100	0.2100	6.9951	110.0000	3664.1002	(29a)
Communal Wall	17.7200		17.7200	0.2200	3.8984	110.0000	1949.1999	(29a)
Total net area of external elements Aum(A, m2)			122.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.5438			(33)
Main dwelling								
Party Wall 1			17.4100	0.0000	0.0000	110.0000	1915.1000	(32)
Party Ceiling 1			51.8600			30.0000	1555.8000	(32b)
Internal Wall 1			88.6000			9.0000	797.4000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15586.2001	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	300.5438	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E2 Other lintels (including other steel lintels)	8.0300	0.0500	0.4015
E4 Jamb	28.8300	0.0160	0.4613
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P1 Party wall - Ground floor	6.0600	0.1080	0.6545
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.5742 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	46.1179 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.7774	11.4992	11.4992	11.0819	11.0819	10.5255	10.6646	10.3864	10.5255	10.8037	10.8037	11.2210	(38)
Heat transfer coeff	57.8953	57.6171	57.6171	57.1998	57.1998	56.6434	56.7825	56.5043	56.6434	56.9216	56.9216	57.3389	(39)
Average = Sum(39)m / 12 =												57.1071	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1164	1.1110	1.1110	1.1030	1.1030	1.0922	1.0949	1.0896	1.0922	1.0976	1.0976	1.1056	(40)
HLP (average)												1.1012	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7449	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.4764	52.6728	51.5017	49.2611	47.6075	45.7635	44.7154	45.8776	47.1516	49.1315	51.4203	53.2715	(42a)

Hot water usage for baths

23.1198	22.7765	22.2930	21.4014	20.7338	19.9936	19.5938	20.0739	20.5967	21.3888	22.2987	23.0417	(42b)

Hot water usage for other uses

32.4999	31.3181	30.1363	28.9545	27.7727	26.5909	26.5909	27.7727	28.9545	30.1363	31.3181	32.4999	(42c)

Average daily hot water use (litres/day)	100.2846	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0962	106.7674	103.9310	99.6170	96.1141	92.3480	90.9000	93.7242	96.7028	100.6566	105.0371	108.8131	(44)
Energy conte	172.7817	152.0353	159.7380	136.3707	129.3880	113.5527	109.9357	116.0502	119.2442	136.5901	149.6446	170.3751	(45)

Energy content (annual) Total = Sum(45)m = 1665.7062
Distribution loss (46)m = 0.15 x (45)m

	25.9173	22.8053	23.9607	20.4556	19.4082	17.0329	16.4904	17.4075	17.8866	20.4885	22.4467	25.5563 (46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950 (56)

If cylinder contains dedicated solar storage

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701 (64)

Total per year (kWh/year) = Sum(64)m = 2010.6312 (64)
Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

	57.4499	50.5517	53.1129	45.3432	43.0215	37.7563	36.5536	38.5867	39.6487	45.4162	49.7568	56.6497 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	104.6964	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.8347	15.8407	12.8825	9.7529	7.2904	6.1549	6.6505	8.6446	11.6028	14.7324	17.1949	18.3304 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	226.9594	229.3145	223.3797	210.7451	194.7962	179.8065	169.7924	167.4373	173.3721	186.0067	201.9556	216.9453 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146	47.2146 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976	-69.7976 (71)

Water heating gains (Table 5)

	77.2176	75.2258	71.3883	62.9767	57.8246	52.4392	49.1312	51.8638	55.0677	61.0433	69.1067	76.1421 (72)

Total internal gains

	404.1251	402.4944	389.7638	365.5881	342.0246	320.5140	307.6876	310.0591	322.1560	343.8958	370.3706	393.5312 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.6200	11.9814	0.3300	0.0000	0.7700	17.1100	(74)
East	11.7500	22.3313	0.3100	0.0000	0.7700	62.6332	(76)

Solar gains	79.7432	139.8969	229.3048	351.9067	429.2691	475.2802	445.5109	384.2130	291.1460	177.4495	101.6857	65.0978 (83)
Total gains	483.8683	542.3912	619.0686	717.4948	771.2937	795.7942	753.1984	694.2721	613.3019	521.3453	472.0563	458.6290 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.7815	75.1426	75.1426	75.6908	75.6908	76.4343	76.2471	76.6225	76.4343	76.0607	76.0607	75.5072	
alpha	5.9854	6.0095	6.0095	6.0461	6.0461	6.0956	6.0831	6.1082	6.0956	6.0707	6.0707	6.0338	
util living area													
	0.9898	0.9792	0.9370	0.8007	0.5827	0.3555	0.2337	0.2604	0.5301	0.8695	0.9753	0.9921	(86)
MIT	20.2088	20.3612	20.6350	20.8915	20.9854	20.9994	21.0000	20.9999	20.9938	20.8531	20.4976	20.1804	(87)
Th 2	19.9875	19.9918	19.9918	19.9984	19.9984	20.0072	20.0050	20.0094	20.0072	20.0028	20.0028	19.9962	(88)
util rest of house													
	0.9859	0.9716	0.9157	0.7510	0.5142	0.2851	0.1587	0.1798	0.4422	0.8190	0.9647	0.9890	(89)
MIT 2	19.1027	19.2964	19.6269	19.9091	19.9899	20.0070	20.0050	20.0094	20.0047	19.8845	19.4774	19.0738	(90)
Living area fraction									fLA = Living area / (4) =			0.4495	(91)
MIT	19.5998	19.7750	20.0800	20.3507	20.4374	20.4531	20.4522	20.4546	20.4493	20.3199	19.9360	19.5712	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5998	19.7750	20.0800	20.3507	20.4374	20.4531	20.4522	20.4546	20.4493	20.3199	19.9360	19.5712	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9696	0.9179	0.7694	0.5447	0.3168	0.1924	0.2160	0.4818	0.8366	0.9638	0.9873	(94)
Useful gains	476.1264	525.8859	568.2197	552.0686	420.1097	252.0800	144.9155	149.9866	295.4704	436.1736	454.9576	452.8061	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W													
	839.4730	816.7234	730.5876	597.7770	425.4161	252.2365	144.9207	149.9967	297.3374	496.3483	679.4147	829.7610	(97)
Space heating kWh													
	270.3298	195.4428	120.8018	32.9101	3.9479	0.0000	0.0000	0.0000	0.0000	44.7699	161.6091	280.4545	(98a)
Space heating requirement - total per year (kWh/year)												1110.2659	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	270.3298	195.4428	120.8018	32.9101	3.9479	0.0000	0.0000	0.0000	0.0000	44.7699	161.6091	280.4545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1110.2659	

Space heating per m2 (98c) / (4) = 21.4089 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	270.3298	195.4428	120.8018	32.9101	3.9479	0.0000	0.0000	0.0000	0.0000	44.7699	161.6091	280.4545	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	270.3298	195.4428	120.8018	32.9101	3.9479	0.0000	0.0000	0.0000	0.0000	44.7699	161.6091	280.4545	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating													
Water heating requirement													
	202.0767	178.4953	189.0330	164.7207	158.6830	141.9027	139.2307	145.3452	147.5942	165.8851	177.9946	199.6701	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.8740	49.3538	52.2674	45.5451	43.8757	39.2359	38.4972	40.1878	40.8097	45.8670	49.2153	55.2086	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0502	7.2712	8.0502	7.7906	8.0502	7.7906	8.0502	8.0502	7.7906	8.0502	7.7906	8.0502	(231)
Lighting	15.6106	12.5234	11.2760	8.2613	6.3812	5.2135	5.8212	7.5666	9.8282	12.8952	14.5651	16.0445	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1110.2659 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 555.9374 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 94.7852 (230a)
Total electricity for the above, kWh/year 94.7852 (231)
Electricity for lighting (calculated in Appendix L) 125.9868 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1886.9753 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1110.2659	27.6700	307.2106	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.9374	27.6700	153.8279	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.7852	27.6700	26.2271	(249)
Energy for lighting	125.9868	27.6700	34.8606	(250)
Additional standing charges			0.0000	(251)
Total energy cost			522.1261	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1110.2659	0.1578	175.2503	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.9374	0.1411	78.4353	(264)
Space and water heating			253.6856	(265)

Pumps, fans and electric keep-hot	94.7852	0.1387	13.1479	(267)
Energy for lighting	125.9868	0.1443	18.1838	(268)
Total CO2, kg/year			285.0172	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1110.2659	1.5843	1759.0188	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.9374	1.5217	845.9677	(278)
Space and water heating			2604.9865	(279)
Pumps, fans and electric keep-hot	94.7852	1.5128	143.3910	(281)
Energy for lighting	125.9868	1.5338	193.2428	(282)
Total Primary energy kWh/year			2941.6203	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-08	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-08
Plot Address	Flat 2, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	6.02	**TER**	16.15
Environmental	96 A	**% DER < TER**			62.72
CO_2 Emissions (t/year)	0.25	**DFEE**	42.68	**TFEE**	42.11
Compliance Check	See BREL	**% DFEE < TFEE**			-1.35
% DPER < TPER	27.90	**DPER**	62.09	**TPER**	86.11

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	1.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	24.50 m	51.78 m²	2.55 m

8.0 Living Area 23.86 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	28.72	16.42	0.00	None	12.30	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	32.78	30.72	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Smoke Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	3.44	3.44	0.60	Stairwell Access Corridor 2	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	15.99	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	69.45

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	51.78

11.0 Heat Loss Floors

Summary for Input Data

elmhurst energy

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	51.78

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	West	2.06	
Patio Door	Window-Red	Brickwork	East	6.71	
East	Window-Red	Brickwork	East	5.59	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	24.50	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	11.40	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.85	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	2.85	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	6.06	0.11	0.11	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	6.06	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	5.99	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	13.99	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No

Y-value	0.00	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0

Summary for Input Data

Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.78	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	6
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	0.00	
In Summer	0.00	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	0.00	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

Summary for Input Data

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-08	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-08
Plot Address	Flat 2, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	6.02	**TER**	16.15
Environmental	96 A	**% DER < TER**			62.72
CO_2 Emissions (t/year)	0.25	**DFEE**	42.68	**TFEE**	42.11
Compliance Check	See BREL	**% DFEE < TFEE**			-1.35
% DPER < TPER	27.90	**DPER**	62.09	**TPER**	86.11

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	132.0390	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7800	(17)
Infiltration rate		0.1390	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1181	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1506	0.1477	0.1447	0.1300	0.1270	0.1122	0.1122	0.1093	0.1181	0.1270	0.1329	0.1388	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2866	0.2837	0.2807	0.2660	0.2630	0.2482	0.2482	0.2453	0.2541	0.2630	0.2689	0.2748	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			12.3000	1.2357	15.1996			(27)
Ground Floor			51.7800	0.1200	6.2136	110.0000	5695.8000	(28a)
Brickwork	28.7200	12.3000	16.4200	0.2100	3.4482	110.0000	1806.1999	(29a)
Communal Wall	32.7800	2.0600	30.7200	0.2200	6.7584	110.0000	3379.1999	(29a)
Smoke Shaft Wall	3.4400		3.4400	0.2200	0.7568	110.0000	378.4000	(29a)
Total net area of external elements Aum(A, m2)			116.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8486			(33)
Main dwelling								
Party Wall 1			15.9900	0.0000	0.0000	110.0000	1758.9000	(32)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			69.4500			9.0000	625.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15196.9497	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	293.4907	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P1 Party wall - Ground floor	6.0600	0.1080	0.6545
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.9900	0.0160	0.2238
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.2372 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.4898	12.3611	12.2324	11.5889	11.4602	10.8166	10.8166	10.6879	11.0740	11.4602	11.7176	11.9750	(38)
Heat transfer coeff	52.7270	52.5983	52.4696	51.8261	51.6974	51.0539	51.0539	50.9252	51.3113	51.6974	51.9548	52.2122	(39)

Average = Sum(39)m / 12 = 51.7939

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0183	1.0158	1.0133	1.0009	0.9984	0.9860	0.9860	0.9835	0.9909	0.9984	1.0034	1.0083	(40)
HLP (average)												1.0003	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

Hot water usage for mixer showers

53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)

Energy content (annual) Total = Sum(45)m = 1664.4731

Distribution loss (46)m = 0.15 x (45)m

25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)

Total per year (kWh/year) = Sum(64)m = 2009.3981 (64)

12Total per year (kWh/year) 2009 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5935	84.8000	76.5935	79.1466	76.5935	79.1466	76.5935	76.5935	79.1466	76.5935	79.1466	76.5935	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857	(72)
Total internal gains	354.7479	362.5398	346.5278	332.2219	313.8493	300.9917	288.4327	289.5875	299.3130	311.1847	332.4664	346.9729	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.3000	19.6403	0.3100	0.0000	0.7700	57.6640	(76)

Solar gains	57.6640	112.8030	185.7705	270.9353	332.0413	339.9034	323.6019	277.9692	216.0588	133.8503	71.9002	47.4201	(83)
Total gains	412.4119	475.3428	532.2983	603.1572	645.8906	640.8950	612.0346	567.5567	515.3718	445.0350	404.3667	394.3930	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.0609	80.2568	80.4537	81.4527	81.6555	82.6847	82.6847	82.8937	82.2699	81.6555	81.2509	80.8503	
alpha	6.3374	6.3505	6.3636	6.4302	6.4437	6.5123	6.5123	6.5262	6.4847	6.4437	6.4167	6.3900	
util living area	0.9956	0.9886	0.9667	0.8816	0.7124	0.5067	0.3667	0.4120	0.6669	0.9325	0.9892	0.9967	(86)
MIT	20.1263	20.2990	20.5418	20.8223	20.9615	20.9963	20.9996	20.9992	20.9807	20.7712	20.3996	20.0985	(87)
Th 2	20.0681	20.0702	20.0722	20.0826	20.0847	20.0950	20.0950	20.0971	20.0909	20.0847	20.0805	20.0764	(88)
util rest of house	0.9940	0.9846	0.9551	0.8475	0.6533	0.4366	0.2915	0.3316	0.5878	0.9038	0.9846	0.9954	(89)
MIT 2	19.0627	19.2828	19.5858	19.9191	20.0571	20.0933	20.0949	20.0969	20.0802	19.8737	19.4199	19.0337	(90)
Living area fraction										fLA = Living area / (4) =		0.4608	(91)
MIT	19.5528	19.7511	20.0263	20.3353	20.4739	20.5094	20.5118	20.5127	20.4952	20.2873	19.8713	19.5244	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5528	19.7511	20.0263	20.3353	20.4739	20.5094	20.5118	20.5127	20.4952	20.2873	19.8713	19.5244	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9929	0.9829	0.9544	0.8577	0.6792	0.4689	0.3262	0.3687	0.6239	0.9110	0.9833	0.9945	(94)
Useful gains	409.4735	467.1921	508.0494	517.3193	438.6635	300.5111	199.6214	209.2408	321.5371	405.4290	397.6134	392.2044	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	804.2350	781.1414	709.7217	592.6445	453.5860	301.6963	199.7129	209.4384	328.1444	500.8083	663.5308	800.1195	(97)
Space heating kWh	293.7025	210.9740	150.0442	54.2342	11.1024	0.0000	0.0000	0.0000	0.0000	70.9622	191.4605	303.4888	(98a)
Space heating requirement - total per year (kWh/year)												1285.9688	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	293.7025	210.9740	150.0442	54.2342	11.1024	0.0000	0.0000	0.0000	0.0000	70.9622	191.4605	303.4888	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1285.9688	
Space heating per m2										(98c) / (4) =		24.8352	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	293.7025	210.9740	150.0442	54.2342	11.1024	0.0000	0.0000	0.0000	0.0000	70.9622	191.4605	303.4888	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	293.7025	210.9740	150.0442	54.2342	11.1024	0.0000	0.0000	0.0000	0.0000	70.9622	191.4605	303.4888	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378	(231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1285.9688	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.5965	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.6389	(230a)
Total electricity for the above, kWh/year	94.6389	(231)
Electricity for lighting (calculated in Appendix L)	125.8149	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2062.0191	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1285.9688	0.1570	201.8372	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			280.2242	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			311.5107	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.0200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1285.9688	1.5810	2033.1686	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	1.5217	845.4483	(278)
Space and water heating			2878.6168	(279)
Pumps, fans and electric keep-hot	94.6389	1.5128	143.1698	(281)
Energy for lighting	125.8149	1.5338	192.9790	(282)
Total Primary energy kWh/year			3214.7657	(286)
Dwelling Primary energy Rate (DPER)			62.0900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800 (1b)	x	2.5500 (2b)	=	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.7800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0390	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1515	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4015	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3412	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4351	0.4266	0.4180	0.3754	0.3668	0.3242	0.3242	0.3157	0.3412	0.3668	0.3839	0.4010	(22b)
Effective ac	0.5947	0.5910	0.5874	0.5705	0.5673	0.5525	0.5525	0.5498	0.5582	0.5673	0.5737	0.5804	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8900	1.1450	12.4695			(27)
Ground Floor			51.7800	0.1300	6.7314			(28a)
Brickwork	28.7200	10.8900	17.8300	0.1800	3.2094			(29a)
Communal Wall	32.7800	2.0600	30.7200	0.1800	5.5296			(29a)
Smoke Shaft Wall	3.4400		3.4400	0.1800	0.6192			(29a)
Total net area of external elements Aum(A, m2)			116.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.6191			(33)
Main dwelling								
Party Wall 1			15.9900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 293.4907 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0700	1.7150
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P1 Party wall - Ground floor	6.0600	0.0800	0.4848
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.9900	0.0500	0.6995
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.2303 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.8494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9107	25.7506	25.5936	24.8563	24.7183	24.0761	24.0761	23.9572	24.3235	24.7183	24.9974	25.2892	(38)
Heat transfer coeff	64.7601	64.6000	64.4430	63.7056	63.5677	62.9255	62.9255	62.8066	63.1729	63.5677	63.8468	64.1385	(39)
Average = Sum(39)m / 12 =												63.7050	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2507	1.2476	1.2446	1.2303	1.2276	1.2152	1.2152	1.2130	1.2200	1.2276	1.2330	1.2387	(40)
HLP (average)												1.2303	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)
Hot water usage for baths	23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)
Hot water usage for other uses	32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)
Average daily hot water use (litres/day)												100.2104	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	219.2487	194.0085	206.2147	181.3616	175.8871	158.5604	156.4492	162.5591	164.2478	183.0838	194.6256	216.8439	(62)
WWHRS	-24.4291	-21.6053	-22.6238	-18.7334	-17.4589	-14.9397	-14.0036	-14.8914	-15.4572	-18.2223	-20.6436	-23.9767	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.8196	172.4032	183.5909	162.6281	158.4283	143.6208	142.4457	147.6678	148.7906	164.8615	173.9820	192.8672	(64)
										Total per year (kWh/year) = Sum(64)m =		1986.1055	(64)
12Total per year (kWh/year)												1986	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	94.6833	84.1829	90.3495	81.3832	80.2656	73.8018	73.8025	75.8340	75.6928	82.6585	85.7935	93.8837	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7956	85.0237	76.7956	79.3555	76.7956	79.3555	76.7956	76.7956	79.3555	76.7956	79.3555	76.7956	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)												
	127.2625	125.2722	121.4375	113.0322	107.8838	102.5025	99.1969	101.9275	105.1289	111.1001	119.1576	126.1878 (72)
Total internal gains												
	408.0521	415.8656	399.8319	385.5328	367.1535	351.3026	338.7369	339.8917	349.6239	364.4889	385.7774	400.2771 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.8900	19.6403	0.6300	0.7000	0.7700	65.3653	(76)

Solar gains	65.3653	127.8683	210.5809	307.1197	376.3867	385.2988	366.8202	315.0931	244.9143	151.7265	81.5028	53.7532 (83)
Total gains	473.4174	543.7339	610.4128	692.6525	743.5402	736.6014	705.5571	654.9848	594.5382	516.2154	467.2802	454.0303 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.1848	65.3464	65.5056	66.2638	66.4076	67.0853	67.0853	67.2123	66.8226	66.4076	66.1173	65.8165	
alpha	5.3457	5.3564	5.3670	5.4176	5.4272	5.4724	5.4724	5.4808	5.4548	5.4272	5.4078	5.3878	
util living area													
	0.9932	0.9850	0.9622	0.8856	0.7342	0.5374	0.3910	0.4383	0.6916	0.9281	0.9850	0.9945	(86)
MIT	19.9051	20.0960	20.3778	20.7171	20.9186	20.9877	20.9982	20.9967	20.9555	20.6728	20.2327	19.8767	(87)
Th 2	19.8797	19.8821	19.8845	19.8958	19.8979	19.9078	19.9078	19.9097	19.9040	19.8979	19.8937	19.8892	(88)
util rest of house													
	0.9906	0.9795	0.9486	0.8489	0.6670	0.4501	0.2947	0.3360	0.5990	0.8955	0.9785	0.9924	(89)
MIT 2	18.6387	18.8813	19.2323	19.6364	19.8398	19.9022	19.9074	19.9088	19.8797	19.6009	19.0649	18.6096	(90)
Living area fraction										fLA = Living area / (4) =		0.4608	(91)
MIT	19.2222	19.4410	19.7601	20.1344	20.3369	20.4024	20.4100	20.4101	20.3754	20.0948	19.6030	19.1935	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2222	19.4410	19.7601	20.1344	20.3369	20.4024	20.4100	20.4101	20.3754	20.0948	19.6030	19.1935	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9886	0.9768	0.9468	0.8577	0.6950	0.4903	0.3392	0.3833	0.6405	0.9023	0.9763	0.9907	(94)
Useful gains	468.0345	531.0966	577.9332	594.0545	516.7332	361.1208	239.3167	251.0356	380.8134	465.7605	456.2193	449.7924	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	966.3661	939.3486	854.5230	715.6940	549.0281	365.1186	239.7478	251.8604	396.4363	603.5646	798.2785	961.6587	(97)
Space heating kWh													
	370.7588	274.3453	205.7828	87.5804	24.0275	0.0000	0.0000	0.0000	0.0000	102.5263	246.2826	380.8285	(98a)
Space heating requirement - total per year (kWh/year)												1692.1322	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	370.7588	274.3453	205.7828	87.5804	24.0275	0.0000	0.0000	0.0000	0.0000	102.5263	246.2826	380.8285	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1692.1322	
Space heating per m2											(98c) / (4) =	32.6793	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	370.7588	274.3453	205.7828	87.5804	24.0275	0.0000	0.0000	0.0000	0.0000	102.5263	246.2826	380.8285	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	401.6888	297.2322	222.9499	94.8867	26.0319	0.0000	0.0000	0.0000	0.0000	111.0794	266.8284	412.5986	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.8196	172.4032	183.5909	162.6281	158.4283	143.6208	142.4457	147.6678	148.7906	164.8615	173.9820	192.8672	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4792	85.0963	84.3163	82.7351	80.8795	79.8000	79.8000	79.8000	79.8000	83.0266	84.8389	85.5561	(217)
Fuel for water heating, kWh/month													
	227.9146	202.5977	217.7406	196.5648	195.8819	179.9759	178.5034	185.0473	186.4544	198.5648	205.0734	225.4277	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9566	12.8010	11.5259	8.4443	6.5227	5.3291	5.9502	7.7343	10.0461	13.1810	14.8879	16.4001	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0107	-20.8327	-31.5710	-37.5014	-42.2255	-40.0921	-39.6239	-36.5254	-31.3627	-24.7092	-15.7887	-11.9918	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-4.9433	-10.6372	-21.5862	-33.0751	-44.3680	-44.7925	-44.2453	-37.1547	-26.8455	-15.4032	-6.6625	-3.8902 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1833.2960	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2399.7465	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.7790	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-639.8390	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.9824	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1833.2960	0.2100	384.9921	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2399.7465	0.2100	503.9468	(264)
Space and water heating			888.9389	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.7790	0.1443	18.5868	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.2352	0.1335	-46.2094	
PV Unit electricity exported	-293.6039	0.1253	-36.7965	
Total			-83.0059	(269)
Total CO2, kg/year			836.4491	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.1500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1833.2960	1.1300	2071.6244	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2399.7465	1.1300	2711.7135	(278)
Space and water heating			4783.3379	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.7790	1.5338	197.5256	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.2352	1.4932	-516.9951	
PV Unit electricity exported	-293.6039	0.4600	-135.0606	
Total			-652.0558	(283)
Total Primary energy kWh/year			4458.9085	(286)
Target Primary Energy Rate (TPER)			86.1100	(287)

Full SAP Calculation Printout

Plot Reference	P-08	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-08
Plot Address	Flat 2, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	6.02	**TER**	16.15
Environmental	96 A	**% DER < TER**			62.72
CO_2 Emissions (t/year)	0.25	**DFEE**	42.68	**TFEE**	42.11
Compliance Check	See BREL	**% DFEE < TFEE**			-1.35
% DPER < TPER	27.90	**DPER**	62.09	**TPER**	86.11

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800 (1b)	x	2.5500 (2b)	=	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0390	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1515	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7800	(17)
Infiltration rate		0.2905	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2469	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3148	0.3086	0.3025	0.2716	0.2654	0.2346	0.2346	0.2284	0.2469	0.2654	0.2778	0.2901	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			12.3000	1.2357	15.1996			(27)
Ground Floor			51.7800	0.1200	6.2136	110.0000	5695.8000	(28a)
Brickwork	28.7200	12.3000	16.4200	0.2100	3.4482	110.0000	1806.1999	(29a)
Communal Wall	32.7800	2.0600	30.7200	0.2200	6.7584	110.0000	3379.1999	(29a)
Smoke Shaft Wall	3.4400		3.4400	0.2200	0.7568	110.0000	378.4000	(29a)
Total net area of external elements Aum(A, m2)			116.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8486			(33)
Main dwelling								
Party Wall 1			15.9900	0.0000	0.0000	110.0000	1758.9000	(32)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			69.4500			9.0000	625.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15196.9497	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							293.4907	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310

E16 Corner (normal)	11.4000	0.0540	0.6156	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765	
E18 Party wall between dwellings	2.8500	0.0380	0.1083	
P1 Party wall - Ground floor	6.0600	0.1080	0.6545	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995	
E4 Jamb	13.9900	0.0160	0.2238	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.2372 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.9454	23.8616	23.7794	23.3934	23.3212	22.9850	22.9850	22.9228	23.1145	23.3212	23.4673	23.6200	(38)
Heat transfer coeff	64.1827	64.0988	64.0166	63.6307	63.5584	63.2223	63.2223	63.1600	63.3518	63.5584	63.7045	63.8573	(39)

Average = Sum(39)m / 12 = 63.6303

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2395	1.2379	1.2363	1.2289	1.2275	1.2210	1.2210	1.2198	1.2235	1.2275	1.2303	1.2332	(40)
HLP (average)												1.2289	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 50.9434 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5786	54.0545	52.3904	50.3186	48.4706	46.5500	46.1504	47.8112	49.5145	51.4869	53.5771	55.5005	(44)
Energy conte	88.0229	76.9729	80.5221	68.8837	65.2507	57.2386	55.8150	59.2002	61.0563	69.8673	76.3304	86.9003	(45)

Energy content (annual) Total = Sum(45)m = 846.0606

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.8195	65.4270	68.4438	58.5511	55.4631	48.6528	47.4427	50.3202	51.8979	59.3872	64.8808	73.8653	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

74.8195	65.4270	68.4438	58.5511	55.4631	48.6528	47.4427	50.3202	51.8979	59.3872	64.8808	73.8653	(64)

Total per year (kWh/year) = Sum(64)m = 719.1515 (64)

12Total per year (kWh/year) 719 (64)

Electric shower(s)

42.7940	38.1298	41.6363	39.7330	40.4786	38.6126	39.8997	40.4786	39.7330	41.6363	40.8534	42.7940	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 486.7793 (64a)

Heat gains from water heating, kWh/month

29.4034	25.8892	27.5200	24.5710	23.9854	21.8164	21.8356	22.6997	22.9077	25.2559	26.4336	29.1648	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5935	84.8000	76.5935	79.1466	76.5935	79.1466	76.5935	76.5935	79.1466	76.5935	79.1466	76.5935	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)	39.5207	38.5256	36.9893	34.1264	32.2385	30.3005	29.3489	30.5103	31.8163	33.9461	36.7133	39.2000	(72)
Total internal gains	317.1081	325.8953	312.1816	303.4183	288.3060	278.8918	268.6868	268.2724	276.1024	284.1327	300.1242	310.0872	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.3000	19.6403	0.3100	0.0000	0.7700	57.6640	(76)

Solar gains	57.6640	112.8030	185.7705	270.9353	332.0413	339.9034	323.6019	277.9692	216.0588	133.8503	71.9002	47.4201	(83)
Total gains	374.7721	438.6983	497.9521	574.3535	620.3473	618.7951	592.2887	546.2416	492.1612	417.9830	372.0244	357.5073	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.7713	65.8573	65.9418	66.3418	66.4172	66.7704	66.7704	66.8362	66.6339	66.4172	66.2649	66.1064	
alpha	5.3848	5.3905	5.3961	5.4228	5.4278	5.4514	5.4514	5.4557	5.4423	5.4278	5.4177	5.4071	
util living area	0.9977	0.9943	0.9836	0.9388	0.8233	0.6300	0.4656	0.5238	0.7907	0.9678	0.9947	0.9982	(86)
MIT	19.7478	19.9307	20.2129	20.5854	20.8556	20.9734	20.9957	20.9921	20.9137	20.5389	20.0738	19.7142	(87)
Th 2	19.8885	19.8898	19.8911	19.8970	19.8981	19.9033	19.9033	19.9042	19.9013	19.8981	19.8958	19.8935	(88)
util rest of house	0.9968	0.9920	0.9769	0.9145	0.7626	0.5329	0.3518	0.4034	0.7012	0.9499	0.9922	0.9976	(89)
MIT 2	18.7637	18.9464	19.2254	19.5834	19.8118	19.8933	19.9024	19.9025	19.8610	19.5495	19.0944	18.7342	(90)
Living area fraction									fLA = Living area / (4) =			0.4608	(91)
MIT	19.2171	19.4000	19.6805	20.0451	20.2928	20.3910	20.4062	20.4046	20.3460	20.0054	19.5457	19.1858	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2171	19.4000	19.6805	20.0451	20.2928	20.3910	20.4062	20.4046	20.3460	20.0054	19.5457	19.1858	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9961	0.9907	0.9753	0.9183	0.7860	0.5774	0.4045	0.4593	0.7403	0.9521	0.9911	0.9969	(94)
Useful gains	373.3074	434.6169	485.6762	527.4420	487.6215	357.2668	239.5790	250.8784	364.3501	397.9443	368.7243	356.4138	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	957.4206	929.4318	843.7692	709.1706	546.1424	366.1200	240.6353	252.9278	395.6977	597.7926	792.8481	956.9491	(97)
Space heating kWh	434.5802	332.5157	266.4211	130.8446	43.5395	0.0000	0.0000	0.0000	0.0000	148.6871	305.3692	446.7983	(98a)
Space heating requirement - total per year (kWh/year)												2108.7557	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	434.5802	332.5157	266.4211	130.8446	43.5395	0.0000	0.0000	0.0000	0.0000	148.6871	305.3692	446.7983	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2108.7557	
Space heating per m2											(98c) / (4) =	40.7253	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	594.2894	467.8448	480.0162	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9033	0.9518	0.9285	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	536.8319	445.2817	445.6776	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	695.9025	666.4366	614.0804	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	114.5308	164.5393	125.2917	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.6327	41.1348	31.3229	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												101.0905	(107)
Energy for space heating												40.7253	(99)
Energy for space cooling												1.9523	(108)
Total												42.6776	(109)
Fabric Energy Efficiency (DFEE)												42.7	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.0390	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1515	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4015	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3412	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4351	0.4266	0.4180	0.3754	0.3668	0.3242	0.3242	0.3157	0.3412	0.3668	0.3839	0.4010	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5947	0.5910	0.5874	0.5705	0.5673	0.5525	0.5525	0.5498	0.5582	0.5673	0.5737	0.5804	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8900	1.1450	12.4695			(27)
Ground Floor			51.7800	0.1300	6.7314			(28a)
Brickwork	28.7200	10.8900	17.8300	0.1800	3.2094			(29a)
Communal Wall	32.7800	2.0600	30.7200	0.1800	5.5296			(29a)
Smoke Shaft Wall	3.4400		3.4400	0.1800	0.6192			(29a)
Total net area of external elements Aum(A, m2)			116.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.6191			(33)
Main dwelling								
Party Wall 1			15.9900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	293.4907	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0700	1.7150
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P1 Party wall - Ground floor	6.0600	0.0800	0.4848
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.9900	0.0500	0.6995
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.2303	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.8494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9107	25.7506	25.5936	24.8563	24.7183	24.0761	24.0761	23.9572	24.3235	24.7183	24.9974	25.2892	(38)
Heat transfer coeff	64.7601	64.6000	64.4430	63.7056	63.5677	62.9255	62.9255	62.8066	63.1729	63.5677	63.8468	64.1385	(39)
Average = Sum(39)m / 12 =												63.7050	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2507	1.2476	1.2446	1.2303	1.2276	1.2152	1.2152	1.2130	1.2200	1.2276	1.2330	1.2387	(40)
HLP (average)												1.2303	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7426	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

	32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)
Average daily hot water use (litres/day)												50.9434	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5786	54.0545	52.3904	50.3186	48.4706	46.5500	46.1504	47.8112	49.5145	51.4869	53.5771	55.5005	(44)
Energy conte	88.0229	76.9729	80.5221	68.8837	65.2507	57.2386	55.8150	59.2002	61.0563	69.8673	76.3304	86.9003	(45)
Energy content (annual)										Total = Sum(45)m =		846.0606	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.8195	65.4270	68.4438	58.5511	55.4631	48.6528	47.4427	50.3202	51.8979	59.3872	64.8808	73.8653	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	74.8195	65.4270	68.4438	58.5511	55.4631	48.6528	47.4427	50.3202	51.8979	59.3872	64.8808	73.8653	(64)
									Total per year (kWh/year) = Sum(64)m =			719.1515	(64)
12Total per year (kWh/year)												719	(64)

Electric shower(s)

	42.7940	38.1298	41.6363	39.7330	40.4786	38.6126	39.8997	40.4786	39.7330	41.6363	40.8534	42.7940	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							486.7793	(64a)

Heat gains from water heating, kWh/month

	29.4034	25.8892	27.5200	24.5710	23.9854	21.8164	21.8356	22.6997	22.9077	25.2559	26.4336	29.1648	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.7956	85.0237	76.7956	79.3555	76.7956	79.3555	76.7956	76.7956	79.3555	76.7956	79.3555	76.7956	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)													
	39.5207	38.5256	36.9893	34.1264	32.2385	30.3005	29.3489	30.5103	31.8163	33.9461	36.7133	39.2000	(72)
Total internal gains													
	317.3102	326.1191	312.3837	303.6271	288.5081	279.1006	268.8889	268.4745	276.3113	284.3348	300.3330	310.2894	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.8900	19.6403	0.6300	0.7000	0.7700	65.3653	(76)

Solar gains	65.3653	127.8683	210.5809	307.1197	376.3867	385.2988	366.8202	315.0931	244.9143	151.7265	81.5028	53.7532	(83)
Total gains	382.6755	453.9874	522.9646	610.7468	664.8949	664.3994	635.7091	583.5676	521.2256	436.0613	381.8358	364.0426	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.1848	65.3464	65.5056	66.2638	66.4076	67.0853	67.0853	67.2123	66.8226	66.4076	66.1173	65.8165	
alpha	5.3457	5.3564	5.3670	5.4176	5.4272	5.4724	5.4724	5.4808	5.4548	5.4272	5.4078	5.3878	
util living area													
	0.9975	0.9933	0.9800	0.9241	0.7909	0.5901	0.4329	0.4897	0.7609	0.9618	0.9940	0.9981	(86)
MIT	19.7466	19.9444	20.2435	20.6291	20.8825	20.9808	20.9970	20.9944	20.9293	20.5655	20.0877	19.7184	(87)
Th 2	19.8797	19.8821	19.8845	19.8958	19.8979	19.9078	19.9078	19.9097	19.9040	19.8979	19.8937	19.8892	(88)
util rest of house													
	0.9965	0.9907	0.9720	0.8958	0.7267	0.4968	0.3269	0.3766	0.6693	0.9414	0.9912	0.9973	(89)
MIT 2	18.7556	18.9538	19.2495	19.6202	19.8297	19.9008	19.9073	19.9085	19.8720	19.5734	19.1063	18.7350	(90)
Living area fraction									fLA = Living area / (4) =			0.4608	(91)
MIT	19.2123	19.4102	19.7075	20.0851	20.3148	20.3985	20.4094	20.4088	20.3592	20.0305	19.5586	19.1881	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2123	19.4102	19.7075	20.0851	20.3148	20.3985	20.4094	20.4088	20.3592	20.0305	19.5586	19.1881	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9893	0.9704	0.9013	0.7525	0.5397	0.3759	0.4290	0.7098	0.9443	0.9901	0.9967	(94)
Useful gains	381.0317	449.1207	507.5013	550.4943	500.3449	358.5493	238.9897	250.3468	369.9870	411.7937	378.0499	362.8313	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	965.7197	937.3598	851.1332	712.5545	547.6258	364.8708	239.7091	251.7816	395.4097	599.4779	795.4394	961.3169	(97)
Space heating kWh													
	435.0078	328.0966	255.6622	116.6833	35.1770	0.0000	0.0000	0.0000	0.0000	139.6371	300.5205	445.2733	(98a)
Space heating requirement - total per year (kWh/year)												2056.0578	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	435.0078	328.0966	255.6622	116.6833	35.1770	0.0000	0.0000	0.0000	0.0000	139.6371	300.5205	445.2733	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2056.0578	
Space heating per m2											(98c) / (4) =	39.7076	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	591.4997	465.6487	477.3300	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9262	0.9648	0.9458	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	547.8528	449.2630	451.4716	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.9798	716.9706	657.4968	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	144.8114	199.1744	153.2827	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	36.2029	49.7936	38.3207	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												124.3171	(107)
Energy for space heating												39.7076	(99)
Energy for space cooling												2.4009	(108)
Total												42.1084	(109)
Fabric Energy Efficiency (TFEE)												42.1	(109)

Full SAP Calculation Printout

Plot Reference	P-08	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-08
Plot Address	Flat 2, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	6.02	**TER**	16.15
Environmental	96 A	**% DER < TER**			62.72
CO_2 Emissions (t/year)	0.25	**DFEE**	42.68	**TFEE**	42.11
Compliance Check	See BREL	**% DFEE < TFEE**			-1.35
% DPER < TPER	27.90	**DPER**	62.09	**TPER**	86.11

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	132.0390	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7800	(17)
Infiltration rate		0.1390	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1181	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1506	0.1477	0.1447	0.1300	0.1270	0.1122	0.1122	0.1093	0.1181	0.1270	0.1329	0.1388	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2866	0.2837	0.2807	0.2660	0.2630	0.2482	0.2482	0.2453	0.2541	0.2630	0.2689	0.2748	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			12.3000	1.2357	15.1996			(27)
Ground Floor			51.7800	0.1200	6.2136	110.0000	5695.8000	(28a)
Brickwork	28.7200	12.3000	16.4200	0.2100	3.4482	110.0000	1806.1999	(29a)
Communal Wall	32.7800	2.0600	30.7200	0.2200	6.7584	110.0000	3379.1999	(29a)
Smoke Shaft Wall	3.4400		3.4400	0.2200	0.7568	110.0000	378.4000	(29a)
Total net area of external elements Aum(A, m2)			116.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8486			(33)
Main dwelling								
Party Wall 1			15.9900	0.0000	0.0000	110.0000	1758.9000	(32)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			69.4500			9.0000	625.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15196.9497	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	293.4907	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P1 Party wall - Ground floor	6.0600	0.1080	0.6545
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.9900	0.0160	0.2238
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.2372 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.4898	12.3611	12.2324	11.5889	11.4602	10.8166	10.8166	10.6879	11.0740	11.4602	11.7176	11.9750	(38)
Heat transfer coeff	52.7270	52.5983	52.4696	51.8261	51.6974	51.0539	51.0539	50.9252	51.3113	51.6974	51.9548	52.2122	(39)

Average = Sum(39)m / 12 = 51.7939

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0183	1.0158	1.0133	1.0009	0.9984	0.9860	0.9860	0.9835	0.9909	0.9984	1.0034	1.0083	(40)
HLP (average)												1.0003	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

Hot water usage for mixer showers

53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)

Energy content (annual) Total = Sum(45)m = 1664.4731

Distribution loss (46)m = 0.15 x (45)m

25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)

Total per year (kWh/year) = Sum(64)m = 2009.3981 (64)

12Total per year (kWh/year) 2009 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5935	84.8000	76.5935	79.1466	76.5935	79.1466	76.5935	76.5935	79.1466	76.5935	79.1466	76.5935	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857	(72)
Total internal gains	354.7479	362.5398	346.5278	332.2219	313.8493	300.9917	288.4327	289.5875	299.3130	311.1847	332.4664	346.9729	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.3000	19.6403	0.3100	0.0000	0.7700	57.6640	(76)

Solar gains	57.6640	112.8030	185.7705	270.9353	332.0413	339.9034	323.6019	277.9692	216.0588	133.8503	71.9002	47.4201	(83)
Total gains	412.4119	475.3428	532.2983	603.1572	645.8906	640.8950	612.0346	567.5567	515.3718	445.0350	404.3667	394.3930	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.0609	80.2568	80.4537	81.4527	81.6555	82.6847	82.6847	82.8937	82.2699	81.6555	81.2509	80.8503	
alpha	6.3374	6.3505	6.3636	6.4302	6.4437	6.5123	6.5123	6.5262	6.4847	6.4437	6.4167	6.3900	
util living area	0.9956	0.9886	0.9667	0.8816	0.7124	0.5067	0.3667	0.4120	0.6669	0.9325	0.9892	0.9967	(86)
MIT	20.1263	20.2990	20.5418	20.8223	20.9615	20.9963	20.9996	20.9992	20.9807	20.7712	20.3996	20.0985	(87)
Th 2	20.0681	20.0702	20.0722	20.0826	20.0847	20.0950	20.0950	20.0971	20.0909	20.0847	20.0805	20.0764	(88)
util rest of house	0.9940	0.9846	0.9551	0.8475	0.6533	0.4366	0.2915	0.3316	0.5878	0.9038	0.9846	0.9954	(89)
MIT 2	19.0627	19.2828	19.5858	19.9191	20.0571	20.0933	20.0949	20.0969	20.0802	19.8737	19.4199	19.0337	(90)
Living area fraction										fLA = Living area / (4) =		0.4608	(91)
MIT	19.5528	19.7511	20.0263	20.3353	20.4739	20.5094	20.5118	20.5127	20.4952	20.2873	19.8713	19.5244	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5528	19.7511	20.0263	20.3353	20.4739	20.5094	20.5118	20.5127	20.4952	20.2873	19.8713	19.5244	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9929	0.9829	0.9544	0.8577	0.6792	0.4689	0.3262	0.3687	0.6239	0.9110	0.9833	0.9945	(94)
Useful gains	409.4735	467.1921	508.0494	517.3193	438.6635	300.5111	199.6214	209.2408	321.5371	405.4290	397.6134	392.2044	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	804.2350	781.1414	709.7217	592.6445	453.5860	301.6963	199.7129	209.4384	328.1444	500.8083	663.5308	800.1195	(97)
Space heating kWh	293.7025	210.9740	150.0442	54.2342	11.1024	0.0000	0.0000	0.0000	0.0000	70.9622	191.4605	303.4888	(98a)
Space heating requirement - total per year (kWh/year)												1285.9688	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	293.7025	210.9740	150.0442	54.2342	11.1024	0.0000	0.0000	0.0000	0.0000	70.9622	191.4605	303.4888	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1285.9688	
Space heating per m2										(98c) / (4) =		24.8352	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	293.7025	210.9740	150.0442	54.2342	11.1024	0.0000	0.0000	0.0000	0.0000	70.9622	191.4605	303.4888	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	293.7025	210.9740	150.0442	54.2342	11.1024	0.0000	0.0000	0.0000	0.0000	70.9622	191.4605	303.4888	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378	(231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1285.9688	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.5965	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.6389	(230a)
Total electricity for the above, kWh/year	94.6389	(231)
Electricity for lighting (calculated in Appendix L)	125.8149	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2062.0191	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1285.9688	0.1570	201.8372	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			280.2242	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			311.5107	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.0200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1285.9688	1.5810	2033.1686	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	1.5217	845.4483	(278)
Space and water heating			2878.6168	(279)
Pumps, fans and electric keep-hot	94.6389	1.5128	143.1698	(281)
Energy for lighting	125.8149	1.5338	192.9790	(282)
Total Primary energy kWh/year			3214.7657	(286)
Dwelling Primary energy Rate (DPER)			62.0900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800 (1b)	x	2.5500 (2b)	=	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.7800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0390	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1515	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4015	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3412	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4351	0.4266	0.4180	0.3754	0.3668	0.3242	0.3242	0.3157	0.3412	0.3668	0.3839	0.4010	(22b)
Effective ac	0.5947	0.5910	0.5874	0.5705	0.5673	0.5525	0.5525	0.5498	0.5582	0.5673	0.5737	0.5804	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8900	1.1450	12.4695			(27)
Ground Floor			51.7800	0.1300	6.7314			(28a)
Brickwork	28.7200	10.8900	17.8300	0.1800	3.2094			(29a)
Communal Wall	32.7800	2.0600	30.7200	0.1800	5.5296			(29a)
Smoke Shaft Wall	3.4400		3.4400	0.1800	0.6192			(29a)
Total net area of external elements Aum(A, m2)			116.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.6191			(33)
Main dwelling								
Party Wall 1			15.9900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 293.4907 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0700	1.7150
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P1 Party wall - Ground floor	6.0600	0.0800	0.4848
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.9900	0.0500	0.6995
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.2303 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.8494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9107	25.7506	25.5936	24.8563	24.7183	24.0761	24.0761	23.9572	24.3235	24.7183	24.9974	25.2892	(38)
Heat transfer coeff	64.7601	64.6000	64.4430	63.7056	63.5677	62.9255	62.9255	62.8066	63.1729	63.5677	63.8468	64.1385	(39)
Average = Sum(39)m / 12 =												63.7050	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2507	1.2476	1.2446	1.2303	1.2276	1.2152	1.2152	1.2130	1.2200	1.2276	1.2330	1.2387	(40)
HLP (average)												1.2303	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)
Hot water usage for baths	23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)
Hot water usage for other uses	32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)
Average daily hot water use (litres/day)												100.2104	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	219.2487	194.0085	206.2147	181.3616	175.8871	158.5604	156.4492	162.5591	164.2478	183.0838	194.6256	216.8439	(62)
WWHRS	-24.4291	-21.6053	-22.6238	-18.7334	-17.4589	-14.9397	-14.0036	-14.8914	-15.4572	-18.2223	-20.6436	-23.9767	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.8196	172.4032	183.5909	162.6281	158.4283	143.6208	142.4457	147.6678	148.7906	164.8615	173.9820	192.8672	(64)
										Total per year (kWh/year) = Sum(64)m =		1986.1055	(64)
12Total per year (kWh/year)												1986	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	94.6833	84.1829	90.3495	81.3832	80.2656	73.8018	73.8025	75.8340	75.6928	82.6585	85.7935	93.8837	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7956	85.0237	76.7956	79.3555	76.7956	79.3555	76.7956	76.7956	79.3555	76.7956	79.3555	76.7956	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)												
	127.2625	125.2722	121.4375	113.0322	107.8838	102.5025	99.1969	101.9275	105.1289	111.1001	119.1576	126.1878 (72)
Total internal gains												
	408.0521	415.8656	399.8319	385.5328	367.1535	351.3026	338.7369	339.8917	349.6239	364.4889	385.7774	400.2771 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.8900	19.6403	0.6300	0.7000	0.7700	65.3653	(76)

Solar gains	65.3653	127.8683	210.5809	307.1197	376.3867	385.2988	366.8202	315.0931	244.9143	151.7265	81.5028	53.7532 (83)
Total gains	473.4174	543.7339	610.4128	692.6525	743.5402	736.6014	705.5571	654.9848	594.5382	516.2154	467.2802	454.0303 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.1848	65.3464	65.5056	66.2638	66.4076	67.0853	67.0853	67.2123	66.8226	66.4076	66.1173	65.8165	
alpha	5.3457	5.3564	5.3670	5.4176	5.4272	5.4724	5.4724	5.4808	5.4548	5.4272	5.4078	5.3878	
util living area													
	0.9932	0.9850	0.9622	0.8856	0.7342	0.5374	0.3910	0.4383	0.6916	0.9281	0.9850	0.9945	(86)
MIT	19.9051	20.0960	20.3778	20.7171	20.9186	20.9877	20.9982	20.9967	20.9555	20.6728	20.2327	19.8767	(87)
Th 2	19.8797	19.8821	19.8845	19.8958	19.8979	19.9078	19.9078	19.9097	19.9040	19.8979	19.8937	19.8892	(88)
util rest of house													
	0.9906	0.9795	0.9486	0.8489	0.6670	0.4501	0.2947	0.3360	0.5990	0.8955	0.9785	0.9924	(89)
MIT 2	18.6387	18.8813	19.2323	19.6364	19.8398	19.9022	19.9074	19.9088	19.8797	19.6009	19.0649	18.6096	(90)
Living area fraction										fLA = Living area / (4) =		0.4608	(91)
MIT	19.2222	19.4410	19.7601	20.1344	20.3369	20.4024	20.4100	20.4101	20.3754	20.0948	19.6030	19.1935	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2222	19.4410	19.7601	20.1344	20.3369	20.4024	20.4100	20.4101	20.3754	20.0948	19.6030	19.1935	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9886	0.9768	0.9468	0.8577	0.6950	0.4903	0.3392	0.3833	0.6405	0.9023	0.9763	0.9907	(94)
Useful gains	468.0345	531.0966	577.9332	594.0545	516.7332	361.1208	239.3167	251.0356	380.8134	465.7605	456.2193	449.7924	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	966.3661	939.3486	854.5230	715.6940	549.0281	365.1186	239.7478	251.8604	396.4363	603.5646	798.2785	961.6587	(97)
Space heating kWh													
	370.7588	274.3453	205.7828	87.5804	24.0275	0.0000	0.0000	0.0000	0.0000	102.5263	246.2826	380.8285	(98a)
Space heating requirement - total per year (kWh/year)												1692.1322	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	370.7588	274.3453	205.7828	87.5804	24.0275	0.0000	0.0000	0.0000	0.0000	102.5263	246.2826	380.8285	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1692.1322	
Space heating per m2											(98c) / (4) =	32.6793	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	370.7588	274.3453	205.7828	87.5804	24.0275	0.0000	0.0000	0.0000	0.0000	102.5263	246.2826	380.8285	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	401.6888	297.2322	222.9499	94.8867	26.0319	0.0000	0.0000	0.0000	0.0000	111.0794	266.8284	412.5986	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.8196	172.4032	183.5909	162.6281	158.4283	143.6208	142.4457	147.6678	148.7906	164.8615	173.9820	192.8672	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4792	85.0963	84.3163	82.7351	80.8795	79.8000	79.8000	79.8000	79.8000	83.0266	84.8389	85.5561	(217)
Fuel for water heating, kWh/month													
	227.9146	202.5977	217.7406	196.5648	195.8819	179.9759	178.5034	185.0473	186.4544	198.5648	205.0734	225.4277	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9566	12.8010	11.5259	8.4443	6.5227	5.3291	5.9502	7.7343	10.0461	13.1810	14.8879	16.4001	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0107	-20.8327	-31.5710	-37.5014	-42.2255	-40.0921	-39.6239	-36.5254	-31.3627	-24.7092	-15.7887	-11.9918	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-4.9433	-10.6372	-21.5862	-33.0751	-44.3680	-44.7925	-44.2453	-37.1547	-26.8455	-15.4032	-6.6625	-3.8902 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1833.2960	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2399.7465	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.7790	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-639.8390	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.9824	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1833.2960	0.2100	384.9921	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2399.7465	0.2100	503.9468	(264)
Space and water heating			888.9389	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.7790	0.1443	18.5868	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.2352	0.1335	-46.2094	
PV Unit electricity exported	-293.6039	0.1253	-36.7965	
Total			-83.0059	(269)
Total CO2, kg/year			836.4491	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.1500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1833.2960	1.1300	2071.6244	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2399.7465	1.1300	2711.7135	(278)
Space and water heating			4783.3379	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.7790	1.5338	197.5256	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.2352	1.4932	-516.9951	
PV Unit electricity exported	-293.6039	0.4600	-135.0606	
Total			-652.0558	(283)
Total Primary energy kWh/year			4458.9085	(286)
Target Primary Energy Rate (TPER)			86.1100	(287)

Full SAP Calculation Printout

Plot Reference	P-08	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-08
Plot Address	Flat 2, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	6.02	**TER**	16.15
Environmental	96 A	**% DER < TER**			62.72
CO_2 Emissions (t/year)	0.25	**DFEE**	42.68	**TFEE**	42.11
Compliance Check	See BREL	**% DFEE < TFEE**			-1.35
% DPER < TPER	27.90	**DPER**	62.09	**TPER**	86.11

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	132.0390	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7800 (17)
Infiltration rate		0.1390 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1181 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1506	0.1477	0.1447	0.1300	0.1270	0.1122	0.1122	0.1093	0.1181	0.1270	0.1329	0.1388	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

Effective ac	0.2866	0.2837	0.2807	0.2660	0.2630	0.2482	0.2482	0.2453	0.2541	0.2630	0.2689	0.2748	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			12.3000	1.2357	15.1996			(27)
Ground Floor			51.7800	0.1200	6.2136	110.0000	5695.8000	(28a)
Brickwork	28.7200	12.3000	16.4200	0.2100	3.4482	110.0000	1806.1999	(29a)
Communal Wall	32.7800	2.0600	30.7200	0.2200	6.7584	110.0000	3379.1999	(29a)
Smoke Shaft Wall	3.4400		3.4400	0.2200	0.7568	110.0000	378.4000	(29a)
Total net area of external elements Aum(A, m2)			116.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8486			(33)
Main dwelling								
Party Wall 1			15.9900	0.0000	0.0000	110.0000	1758.9000	(32)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			69.4500			9.0000	625.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15196.9497 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		293.4907 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P1 Party wall - Ground floor	6.0600	0.1080	0.6545
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.9900	0.0160	0.2238
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.2372 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.4898	12.3611	12.2324	11.5889	11.4602	10.8166	10.8166	10.6879	11.0740	11.4602	11.7176	11.9750	(38)
Heat transfer coeff	52.7270	52.5983	52.4696	51.8261	51.6974	51.0539	51.0539	50.9252	51.3113	51.6974	51.9548	52.2122	(39)
Average = Sum(39)m / 12 =												51.7939	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0183	1.0158	1.0133	1.0009	0.9984	0.9860	0.9860	0.9835	0.9909	0.9984	1.0034	1.0083	(40)
HLP (average)												1.0003	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)
Hot water usage for mixer showers

53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
									Total per year (kWh/year) = Sum(64)m =			2009.3981	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8104	15.8190	12.8649	9.7396	7.2804	6.1465	6.6415	8.6328	11.5869	14.7123	17.1714	18.3054	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6496	229.0015	223.0748	210.4574	194.5303	179.5610	169.5607	167.2087	173.1355	185.7528	201.6800	216.6492	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857	(72)
Total internal gains	403.6701	402.0403	389.3248	365.1768	341.6422	320.1576	307.3466	309.7166	321.7990	343.5129	369.9566	393.0900	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.3000	19.6403	0.3100	0.0000	0.7700	57.6640	(76)

Solar gains	57.6640	112.8030	185.7705	270.9353	332.0413	339.9034	323.6019	277.9692	216.0588	133.8503	71.9002	47.4201	(83)

Total gains	461.3341	514.8434	575.0953	636.1120	673.6835	660.0610	630.9485	587.6859	537.8578	477.3632	441.8568	440.5101	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.0609	80.2568	80.4537	81.4527	81.6555	82.6847	82.6847	82.8937	82.2699	81.6555	81.2509	80.8503	
alpha	6.3374	6.3505	6.3636	6.4302	6.4437	6.5123	6.5123	6.5262	6.4847	6.4437	6.4167	6.3900	
util living area													
	0.9920	0.9829	0.9529	0.8592	0.6884	0.4924	0.3558	0.3980	0.6426	0.9113	0.9830	0.9939	(86)
MIT	20.2138	20.3662	20.6040	20.8498	20.9682	20.9968	20.9997	20.9993	20.9843	20.8086	20.4635	20.1818	(87)
Th 2	20.0681	20.0702	20.0722	20.0826	20.0847	20.0950	20.0950	20.0971	20.0909	20.0847	20.0805	20.0764	(88)
util rest of house													
	0.9892	0.9771	0.9377	0.8219	0.6295	0.4241	0.2828	0.3202	0.5649	0.8770	0.9761	0.9917	(89)
MIT 2	19.1734	19.3665	19.6595	19.9469	20.0622	20.0936	20.0950	20.0969	20.0824	19.9131	19.4991	19.1395	(90)
Living area fraction										fLA = Living area / (4) =		0.4608	(91)
MIT	19.6528	19.8271	20.0947	20.3630	20.4797	20.5098	20.5118	20.5128	20.4980	20.3257	19.9435	19.6198	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6528	19.8271	20.0947	20.3630	20.4797	20.5098	20.5118	20.5128	20.4980	20.3257	19.9435	19.6198	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9876	0.9753	0.9381	0.8341	0.6555	0.4556	0.3164	0.3561	0.6004	0.8870	0.9748	0.9903	(94)
Useful gains	455.6189	502.1176	539.5101	530.5734	441.6144	300.7138	199.6387	209.2825	322.9494	423.4384	430.7367	436.2298	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	809.5068	785.1422	713.3107	594.0804	453.8879	301.7171	199.7149	209.4431	328.2883	502.7935	667.2830	805.1004	(97)
Space heating kWh													
	263.2927	190.1925	129.3077	45.7250	9.1315	0.0000	0.0000	0.0000	0.0000	59.0402	170.3134	274.4397	(98a)
Space heating requirement - total per year (kWh/year)												1141.4426	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	263.2927	190.1925	129.3077	45.7250	9.1315	0.0000	0.0000	0.0000	0.0000	59.0402	170.3134	274.4397	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1141.4426	
Space heating per m2											(98c) / (4) =	22.0441	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	263.2927	190.1925	129.3077	45.7250	9.1315	0.0000	0.0000	0.0000	0.0000	59.0402	170.3134	274.4397	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	263.2927	190.1925	129.3077	45.7250	9.1315	0.0000	0.0000	0.0000	0.0000	59.0402	170.3134	274.4397	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378	(231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1141.4426	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.5965	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)

mechanical ventilation fans (SFP = 0.5875)	94.6389	(230a)
Total electricity for the above, kWh/year	94.6389	(231)
Electricity for lighting (calculated in Appendix L)	125.8149	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1917.4929	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1141.4426	16.4900	188.2239	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	16.4900	91.6179	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6389	16.4900	15.6060	(249)
Energy for lighting	125.8149	16.4900	20.7469	(250)
Additional standing charges			0.0000	(251)
Total energy cost			316.1946	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1762	(257)
SAP value		80.9342	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1141.4426	0.1571	179.3561	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			257.7431	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			289.0296	(272)
CO2 emissions per m2			5.5800	(273)
EI value			95.9981	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.0390	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7800	(17)
Infiltration rate		0.1390	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1181 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1270	0.1211	0.1211	0.1122	0.1152	0.1004	0.1004	0.0975	0.1004	0.1122	0.1093	0.1181	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2630	0.2571	0.2571	0.2482	0.2512	0.2364	0.2364	0.2335	0.2364	0.2482	0.2453	0.2541	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			12.3000	1.2357	15.1996			(27)
Ground Floor			51.7800	0.1200	6.2136	110.0000	5695.8000	(28a)
Brickwork	28.7200	12.3000	16.4200	0.2100	3.4482	110.0000	1806.1999	(29a)
Communal Wall	32.7800	2.0600	30.7200	0.2200	6.7584	110.0000	3379.1999	(29a)
Smoke Shaft Wall	3.4400		3.4400	0.2200	0.7568	110.0000	378.4000	(29a)
Total net area of external elements Aum(A, m2)			116.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8486			(33)
Main dwelling								
Party Wall 1			15.9900	0.0000	0.0000	110.0000	1758.9000	(32)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			69.4500			9.0000	625.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15196.9497 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 293.4907 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P1 Party wall - Ground floor	6.0600	0.1080	0.6545
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.9900	0.0160	0.2238
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.2372 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.4602	11.2027	11.2027	10.8166	10.9453	10.3018	10.3018	10.1731	10.3018	10.8166	10.6879	11.0740	(38)
Heat transfer coeff	51.6974	51.4400	51.4400	51.0539	51.1826	50.5391	50.5391	50.4104	50.5391	51.0539	50.9252	51.3113	(39)
Average = Sum(39)m / 12 =												51.0110	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9984	0.9934	0.9934	0.9860	0.9885	0.9760	0.9760	0.9735	0.9760	0.9860	0.9835	0.9909	(40)
HLP (average)												0.9851	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)
Hot water usage for mixer showers

53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)

Total per year (kWh/year) = Sum(64)m = 2009.3981 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8104	15.8190	12.8649	9.7396	7.2804	6.1465	6.6415	8.6328	11.5869	14.7123	17.1714	18.3054	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.6496	229.0015	223.0748	210.4574	194.5303	179.5610	169.5607	167.2087	173.1355	185.7528	201.6800	216.6492	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)													
	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857	(72)
Total internal gains													
	403.6701	402.0403	389.3248	365.1768	341.6422	320.1576	307.3466	309.7166	321.7990	343.5129	369.9566	393.0900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.3000	23.8018	0.3100	0.0000	0.7700	69.8822	(76)

Solar gains	69.8822	119.4051	194.8655	287.7782	342.9904	371.1595	349.9680	308.6388	241.3460	151.9889	85.8337	57.7988	(83)
Total gains	473.5523	521.4455	584.1903	652.9550	684.6326	691.3171	657.3146	618.3554	563.1450	495.5018	455.7902	450.8888	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.6555	82.0641	82.0641	82.6847	82.4768	83.5270	83.5270	83.7402	83.5270	82.6847	82.8937	82.2699	
alpha	6.4437	6.4709	6.4709	6.5123	6.4985	6.5685	6.5685	6.5827	6.5685	6.5123	6.5262	6.4847	
util living area													
	0.9877	0.9753	0.9306	0.7983	0.5962	0.3797	0.2537	0.2771	0.5342	0.8574	0.9710	0.9903	(86)
MIT	20.3392	20.4802	20.7089	20.9151	20.9880	20.9995	21.0000	21.0000	20.9955	20.8876	20.5897	20.3103	(87)
Th 2	20.0847	20.0888	20.0888	20.0950	20.0930	20.1034	20.1034	20.1054	20.1034	20.0950	20.0971	20.0909	(88)
util rest of house													
	0.9833	0.9670	0.9091	0.7520	0.5333	0.3145	0.1848	0.2042	0.4565	0.8089	0.9594	0.9868	(89)
MIT 2	19.3450	19.5236	19.7974	20.0243	20.0856	20.1032	20.1033	20.1054	20.1014	20.0039	19.6682	19.3138	(90)
Living area fraction									fLA = Living area / (4) =			0.4608	(91)
MIT	19.8031	19.9644	20.2174	20.4348	20.5014	20.5162	20.5165	20.5176	20.5134	20.4111	20.0928	19.7730	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8031	19.9644	20.2174	20.4348	20.5014	20.5162	20.5165	20.5176	20.5134	20.4111	20.0928	19.7730	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9656	0.9125	0.7702	0.5620	0.3446	0.2165	0.2378	0.4923	0.8271	0.9593	0.9852	(94)
Useful gains	464.8331	503.5008	533.0525	502.8838	384.7307	238.2082	142.3389	147.0695	277.2486	409.8490	437.2464	444.2373	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	760.1128	733.7615	659.3281	537.8415	389.0615	238.3514	142.3437	147.0783	278.6400	454.9447	615.8277	752.8899	(97)
Space heating kWh													
	219.6881	154.7352	93.9491	25.1696	3.2221	0.0000	0.0000	0.0000	0.0000	33.5512	128.5785	229.6376	(98a)
Space heating requirement - total per year (kWh/year)												888.5314	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	219.6881	154.7352	93.9491	25.1696	3.2221	0.0000	0.0000	0.0000	0.0000	33.5512	128.5785	229.6376	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												888.5314	
Space heating per m2											(98c) / (4) =	17.1597	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	219.6881	154.7352	93.9491	25.1696	3.2221	0.0000	0.0000	0.0000	0.0000	33.5512	128.5785	229.6376	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	219.6881	154.7352	93.9491	25.1696	3.2221	0.0000	0.0000	0.0000	0.0000	33.5512	128.5785	229.6376	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement												
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440 (64)
Efficiency of water heater												361.6650 (216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)
Fuel for water heating, kWh/month												
	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378 (231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	888.5314 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	361.6650
Water heating fuel used	555.5965 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)	
mechanical ventilation fans (SFP = 0.5875)	94.6389 (230a)
Total electricity for the above, kWh/year	94.6389 (231)
Electricity for lighting (calculated in Appendix L)	125.8149 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1664.5817 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	888.5314	27.6700	245.8566	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	27.6700	153.7335	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6389	27.6700	26.1866	(249)
Energy for lighting	125.8149	27.6700	34.8130	(250)
Additional standing charges			0.0000	(251)
Total energy cost			460.5897	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	888.5314	0.1580	140.3748	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			218.7618	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			250.0484	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	888.5314	1.5848	1408.1714	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	1.5217	845.4483	(278)
Space and water heating			2253.6197	(279)
Pumps, fans and electric keep-hot	94.6389	1.5128	143.1698	(281)
Energy for lighting	125.8149	1.5338	192.9790	(282)
Total Primary energy kWh/year			2589.7685	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£461	£461	£0
Space heating	£272	£272	£0
Water heating	£154	£154	£0
Lighting	£35	£35	£0
Total cost of fuels	£461	£461	£0
Total cost of uses	£461	£461	£0
Delivered energy	32 kWh/m²	32 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	50 kWh/m²	50 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800 (1b)	x	2.5500 (2b)	=	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0390	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.7800	(17)
Infiltration rate			0.1390	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1181	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1506	0.1477	0.1447	0.1300	0.1270	0.1122	0.1122	0.1093	0.1181	0.1270	0.1329	0.1388	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2866	0.2837	0.2807	0.2660	0.2630	0.2482	0.2482	0.2453	0.2541	0.2630	0.2689	0.2748	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			12.3000	1.2357	15.1996			(27)
Ground Floor			51.7800	0.1200	6.2136	110.0000	5695.8000	(28a)
Brickwork	28.7200	12.3000	16.4200	0.2100	3.4482	110.0000	1806.1999	(29a)
Communal Wall	32.7800	2.0600	30.7200	0.2200	6.7584	110.0000	3379.1999	(29a)
Smoke Shaft Wall	3.4400		3.4400	0.2200	0.7568	110.0000	378.4000	(29a)
Total net area of external elements Aum(A, m2)			116.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8486			(33)
Main dwelling								
Party Wall 1			15.9900	0.0000	0.0000	110.0000	1758.9000	(32)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			69.4500			9.0000	625.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15196.9497 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 293.4907 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P1 Party wall - Ground floor	6.0600	0.1080	0.6545
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.9900	0.0160	0.2238
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3886 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.2372 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.4898	12.3611	12.2324	11.5889	11.4602	10.8166	10.8166	10.6879	11.0740	11.4602	11.7176	11.9750	(38)
Heat transfer coeff	52.7270	52.5983	52.4696	51.8261	51.6974	51.0539	51.0539	50.9252	51.3113	51.6974	51.9548	52.2122	(39)
Average = Sum(39)m / 12 =												51.7939	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0183	1.0158	1.0133	1.0009	0.9984	0.9860	0.9860	0.9835	0.9909	0.9984	1.0034	1.0083	(40)
HLP (average)												1.0003	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)
Hot water usage for mixer showers

53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
									Total per year (kWh/year) = Sum(64)m =		2009.3981	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8104	15.8190	12.8649	9.7396	7.2804	6.1465	6.6415	8.6328	11.5869	14.7123	17.1714	18.3054	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6496	229.0015	223.0748	210.4574	194.5303	179.5610	169.5607	167.2087	173.1355	185.7528	201.6800	216.6492	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	

Losses e.g. evaporation (negative values) (Table 5)

-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)

Water heating gains (Table 5)

77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857	(72)

Total internal gains

403.6701	402.0403	389.3248	365.1768	341.6422	320.1576	307.3466	309.7166	321.7990	343.5129	369.9566	393.0900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.3000	19.6403	0.3100	0.0000	0.7700	57.6640	(76)

Solar gains	57.6640	112.8030	185.7705	270.9353	332.0413	339.9034	323.6019	277.9692	216.0588	133.8503	71.9002	47.4201	(83)
Total gains	461.3341	514.8434	575.0953	636.1120	673.6835	660.0610	630.9485	587.6859	537.8578	477.3632	441.8568	440.5101	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.0609	80.2568	80.4537	81.4527	81.6555	82.6847	82.6847	82.8937	82.2699	81.6555	81.2509	80.8503	
alpha	6.3374	6.3505	6.3636	6.4302	6.4437	6.5123	6.5123	6.5262	6.4847	6.4437	6.4167	6.3900	
util living area	0.9920	0.9829	0.9529	0.8592	0.6884	0.4924	0.3558	0.3980	0.6426	0.9113	0.9830	0.9939	(86)
MIT	20.2138	20.3662	20.6040	20.8498	20.9682	20.9968	20.9997	20.9993	20.9843	20.8086	20.4635	20.1818	(87)
Th 2	20.0681	20.0702	20.0722	20.0826	20.0847	20.0950	20.0950	20.0971	20.0909	20.0847	20.0805	20.0764	(88)
util rest of house	0.9892	0.9771	0.9377	0.8219	0.6295	0.4241	0.2828	0.3202	0.5649	0.8770	0.9761	0.9917	(89)
MIT 2	19.1734	19.3665	19.6595	19.9469	20.0622	20.0936	20.0950	20.0969	20.0824	19.9131	19.4991	19.1395	(90)
Living area fraction									fLA = Living area / (4) =			0.4608	(91)
MIT	19.6528	19.8271	20.0947	20.3630	20.4797	20.5098	20.5118	20.5128	20.4980	20.3257	19.9435	19.6198	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6528	19.8271	20.0947	20.3630	20.4797	20.5098	20.5118	20.5128	20.4980	20.3257	19.9435	19.6198	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9876	0.9753	0.9381	0.8341	0.6555	0.4556	0.3164	0.3561	0.6004	0.8870	0.9748	0.9903	(94)
Useful gains	455.6189	502.1176	539.5101	530.5734	441.6144	300.7138	199.6387	209.2825	322.9494	423.4384	430.7367	436.2298	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	809.5068	785.1422	713.3107	594.0804	453.8879	301.7171	199.7149	209.4431	328.2883	502.7935	667.2830	805.1004	(97)
Space heating kWh	263.2927	190.1925	129.3077	45.7250	9.1315	0.0000	0.0000	0.0000	0.0000	59.0402	170.3134	274.4397	(98a)
Space heating requirement - total per year (kWh/year)												1141.4426	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	263.2927	190.1925	129.3077	45.7250	9.1315	0.0000	0.0000	0.0000	0.0000	59.0402	170.3134	274.4397	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1141.4426	
Space heating per m2											(98c) / (4) =	22.0441	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	263.2927	190.1925	129.3077	45.7250	9.1315	0.0000	0.0000	0.0000	0.0000	59.0402	170.3134	274.4397	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	263.2927	190.1925	129.3077	45.7250	9.1315	0.0000	0.0000	0.0000	0.0000	59.0402	170.3134	274.4397	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378	(231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1141.4426	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.5965	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.6389	(230a)
Total electricity for the above, kWh/year	94.6389	(231)
Electricity for lighting (calculated in Appendix L)	125.8149	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1917.4929	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1141.4426	16.4900	188.2239	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	16.4900	91.6179	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6389	16.4900	15.6060	(249)
Energy for lighting	125.8149	16.4900	20.7469	(250)
Additional standing charges			0.0000	(251)
Total energy cost			316.1946	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1762	(257)
SAP value		80.9342	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1141.4426	0.1571	179.3561	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			257.7431	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			289.0296	(272)
CO2 emissions per m2			5.5800	(273)
EI value			95.9981	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.0390	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7800	(17)
Infiltration rate		0.1390	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1181	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1270	0.1211	0.1211	0.1122	0.1152	0.1004	0.1004	0.0975	0.1004	0.1122	0.1093	0.1181	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2630	0.2571	0.2571	0.2482	0.2512	0.2364	0.2364	0.2335	0.2364	0.2482	0.2453	0.2541	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			12.3000	1.2357	15.1996			(27)
Ground Floor			51.7800	0.1200	6.2136	110.0000	5695.8000	(28a)
Brickwork	28.7200	12.3000	16.4200	0.2100	3.4482	110.0000	1806.1999	(29a)
Communal Wall	32.7800	2.0600	30.7200	0.2200	6.7584	110.0000	3379.1999	(29a)
Smoke Shaft Wall	3.4400		3.4400	0.2200	0.7568	110.0000	378.4000	(29a)
Total net area of external elements Aum(A, m2)			116.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8486			(33)
Main dwelling								
Party Wall 1			15.9900	0.0000	0.0000	110.0000	1758.9000	(32)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			69.4500			9.0000	625.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15196.9497	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	293.4907	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P1 Party wall - Ground floor	6.0600	0.1080	0.6545
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.9900	0.0160	0.2238
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.3886	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 40.2372	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.4602	11.2027	11.2027	10.8166	10.9453	10.3018	10.3018	10.1731	10.3018	10.8166	10.6879	11.0740	(38)
Heat transfer coeff	51.6974	51.4400	51.4400	51.0539	51.1826	50.5391	50.5391	50.4104	50.5391	51.0539	50.9252	51.3113	(39)
Average = Sum(39)m / 12 =												51.0110	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9984	0.9934	0.9934	0.9860	0.9885	0.9760	0.9760	0.9735	0.9760	0.9860	0.9835	0.9909	(40)
HLP (average)												0.9851	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7426	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day)	100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m													
	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):

Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
										Total per year (kWh/year) = Sum(64)m =		2009.3981	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8104	15.8190	12.8649	9.7396	7.2804	6.1465	6.6415	8.6328	11.5869	14.7123	17.1714	18.3054	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.6496	229.0015	223.0748	210.4574	194.5303	179.5610	169.5607	167.2087	173.1355	185.7528	201.6800	216.6492	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)													
	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857	(72)
Total internal gains													
	403.6701	402.0403	389.3248	365.1768	341.6422	320.1576	307.3466	309.7166	321.7990	343.5129	369.9566	393.0900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.3000	23.8018	0.3100	0.0000	0.7700	69.8822	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	69.8822	119.4051	194.8655	287.7782	342.9904	371.1595	349.9680	308.6388	241.3460	151.9889	85.8337	57.7988	(83)
Total gains	473.5523	521.4455	584.1903	652.9550	684.6326	691.3171	657.3146	618.3554	563.1450	495.5018	455.7902	450.8888	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.6555	82.0641	82.0641	82.6847	82.4768	83.5270	83.5270	83.7402	83.5270	82.6847	82.8937	82.2699	
alpha	6.4437	6.4709	6.4709	6.5123	6.4985	6.5685	6.5685	6.5827	6.5685	6.5123	6.5262	6.4847	
util living area													
	0.9877	0.9753	0.9306	0.7983	0.5962	0.3797	0.2537	0.2771	0.5342	0.8574	0.9710	0.9903	(86)
MIT	20.3392	20.4802	20.7089	20.9151	20.9880	20.9995	21.0000	21.0000	20.9955	20.8876	20.5897	20.3103	(87)
Th 2	20.0847	20.0888	20.0888	20.0950	20.0930	20.1034	20.1034	20.1054	20.1034	20.0950	20.0971	20.0909	(88)
util rest of house													
	0.9833	0.9670	0.9091	0.7520	0.5333	0.3145	0.1848	0.2042	0.4565	0.8089	0.9594	0.9868	(89)
MIT 2	19.3450	19.5236	19.7974	20.0243	20.0856	20.1032	20.1033	20.1054	20.1014	20.0039	19.6682	19.3138	(90)
Living area fraction										fLA = Living area / (4) =		0.4608	(91)
MIT	19.8031	19.9644	20.2174	20.4348	20.5014	20.5162	20.5165	20.5176	20.5134	20.4111	20.0928	19.7730	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8031	19.9644	20.2174	20.4348	20.5014	20.5162	20.5165	20.5176	20.5134	20.4111	20.0928	19.7730	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9656	0.9125	0.7702	0.5620	0.3446	0.2165	0.2378	0.4923	0.8271	0.9593	0.9852	(94)
Useful gains	464.8331	503.5008	533.0525	502.8838	384.7307	238.2082	142.3389	147.0695	277.2486	409.8490	437.2464	444.2373	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	760.1128	733.7615	659.3281	537.8415	389.0615	238.3514	142.3437	147.0783	278.6400	454.9447	615.8277	752.8899	(97)
Space heating kWh													
	219.6881	154.7352	93.9491	25.1696	3.2221	0.0000	0.0000	0.0000	0.0000	33.5512	128.5785	229.6376	(98a)
Space heating requirement - total per year (kWh/year)												888.5314	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	219.6881	154.7352	93.9491	25.1696	3.2221	0.0000	0.0000	0.0000	0.0000	33.5512	128.5785	229.6376	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												888.5314	
Space heating per m2											(98c) / (4) =	17.1597	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	219.6881	154.7352	93.9491	25.1696	3.2221	0.0000	0.0000	0.0000	0.0000	33.5512	128.5785	229.6376	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	219.6881	154.7352	93.9491	25.1696	3.2221	0.0000	0.0000	0.0000	0.0000	33.5512	128.5785	229.6376	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378	(231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	888.5314 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	361.6650
Water heating fuel used	555.5965 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)	
mechanical ventilation fans (SFP = 0.5875)	94.6389 (230a)
Total electricity for the above, kWh/year	94.6389 (231)
Electricity for lighting (calculated in Appendix L)	125.8149 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1664.5817 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	888.5314	27.6700	245.8566	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	27.6700	153.7335	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6389	27.6700	26.1866	(249)
Energy for lighting	125.8149	27.6700	34.8130	(250)
Additional standing charges			0.0000	(251)
Total energy cost			460.5897	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	888.5314	0.1580	140.3748	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			218.7618	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			250.0484	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	888.5314	1.5848	1408.1714	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	1.5217	845.4483	(278)
Space and water heating			2253.6197	(279)
Pumps, fans and electric keep-hot	94.6389	1.5128	143.1698	(281)
Energy for lighting	125.8149	1.5338	192.9790	(282)
Total Primary energy kWh/year			2589.7685	(286)

Summary for Input Data

Plot Reference	P-09	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-09
Plot Address	Flat 4, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.36	**TER**	13.52
Environmental	96 A	**% DER < TER**			60.36
CO_2 Emissions (t/year)	0.29	**DFEE**	39.18	**TFEE**	35.76
Compliance Check	See BREL	**% DFEE < TFEE**			-9.57
% DPER < TPER	22.82	**DPER**	55.33	**TPER**	71.68

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	242.49	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	27.17 m	66.96 m²	2.55 m

8.0 Living Area	31.28	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	63.59	39.76	0.00	None	23.83	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	15.01	15.01	0.60	Stairwell Access Corridor 2	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	30.00	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	124.72

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	66.96

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)

Exposed Floor	Exposed Floor - Solid	Lowest occupied	Other	0.14	Garage Single 1 Inside	0.70	110.00	15.12

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	30.24

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Brickwork	South	2.06	
Patio Door	Window-Red	Brickwork	East	6.50	
East	Window-Red	Brickwork	East	4.91	
North	Window	Brickwork	North	8.17	
South	Window-Red	Brickwork	South	2.18	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	44.68	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	8.55	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	8.78	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	11.70	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	16.39	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	10.08	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	37.69	0.02	0.02	RCD	No
E20 Exposed floor (normal)	Independently assessed	6.99	0.12	0.12	-	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	2.67	0.33	0.33	Abbey Calculated	No
P7 Party Wall - Exposed floor (normal)	Table K1 - Default	4.33	0.48	0.48	-	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No

Y-value	0.07	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes	
Approved Installation	Yes	
Mechanical Ventilation data Type	Database	
Type	Balanced mechanical ventilation with heat recovery	
MV Reference Number	500841	
Configuration	1	
Manufacturer SFP	0.47	
Duct Type	Rigid	
MVHR Efficiency	91.00	
Wet Rooms	1	
SFP from Installer Commissioning Certificate	No	
MVHR System Location	Inside heated envelope (installed exclusively)	
Duct Installation Specification	Level 2	

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	

Summary for Input Data

elmhurst energy

Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.78	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	8
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes

Summary for Input Data

Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-09	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-09
Plot Address	Flat 4, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.36	**TER**	13.52
Environmental	96 A	**% DER < TER**			60.36
CO_2 Emissions (t/year)	0.29	**DFEE**	39.18	**TFEE**	35.76
Compliance Check	See BREL	**% DFEE < TFEE**			-9.57
% DPER < TPER	22.82	**DPER**	55.33	**TPER**	71.68

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.5500 (2b)	=	170.7480	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7800	(17)
Infiltration rate		0.1390	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1181	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1506	0.1477	0.1447	0.1300	0.1270	0.1122	0.1122	0.1093	0.1181	0.1270	0.1329	0.1388	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2866	0.2837	0.2807	0.2660	0.2630	0.2482	0.2482	0.2453	0.2541	0.2630	0.2689	0.2748	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.5900	1.2357	16.7937			(27)
Exposed Floor			15.1200	0.1275	1.9279	110.0000	1663.2000	(28b)
Brickwork	63.5900	23.8200	39.7700	0.2100	8.3517	110.0000	4374.7000	(29a)
Communal Wall	15.0100		15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Total net area of external elements Aum(A, m2)			93.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2025			(33)
Main dwelling								
Party Wall 1			30.0000	0.0000	0.0000	110.0000	3300.0000	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			66.9600			30.0000	2008.8000	(32b)
Internal Wall 1			124.7200			9.0000	1122.4800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16237.0801	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.4893 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E7 Party floor between dwellings (in blocks of flats)	44.6800	0.0380	1.6978
	E16 Corner (normal)	8.5500	0.0540	0.4617
	E17 Corner (inverted - internal area greater than external area)	8.7800	-0.0970	-0.8517
	E18 Party wall between dwellings	11.7000	0.0380	0.4446
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3900	0.0000	0.0000
	E2 Other lintels (including other steel lintels)	10.0800	0.0500	0.5040
	E4 Jamb	37.6900	0.0160	0.6030
	E20 Exposed floor (normal)	6.9900	0.1200	0.8388
	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6700	0.3300	0.8811
	P7 Party Wall - Exposed floor (normal)	4.3300	0.4800	2.0784
	E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7462 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 48.9486 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.1513	15.9849	15.8185	14.9863	14.8199	13.9877	13.9877	13.8212	14.3205	14.8199	15.1527	15.4856	(38)
Heat transfer coeff	65.1000	64.9335	64.7671	63.9349	63.7685	62.9363	62.9363	62.7699	63.2692	63.7685	64.1013	64.4342	(39)

Average = Sum(39)m / 12 = 63.8933

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9722	0.9697	0.9673	0.9548	0.9523	0.9399	0.9399	0.9374	0.9449	0.9523	0.9573	0.9623	(40)
HLP (average)												0.9542	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)

Energy content (annual) Total = Sum(45)m = 1887.8373

Distribution loss (46)m = 0.15 x (45)m

29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)

Total per year (kWh/year) = Sum(64)m = 2232.7623 (64)

12Total per year (kWh/year) 2233 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8839	106.1572	95.8839	99.0800	95.8839	99.0800	95.8839	95.8839	99.0800	95.8839	99.0800	95.8839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains	429.0515	439.0397	419.4459	402.5261	380.1320	364.6692	349.3364	350.4609	362.2593	376.4184	402.1120	419.4449	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	10.6334	0.3300	0.0000	0.7700	22.0749	(74)

East			11.4100		19.6403		0.3100		0.0000		0.7700		53.4916 (76)
South			2.1800		46.7521		0.3100		0.0000		0.7700		24.3282 (78)
Solar gains	99.8946	186.6704	294.7666	423.8373	522.9002	538.8835	511.4209	435.4348	339.6314	217.3572	122.7671	83.4134	(83)
Total gains	528.9462	625.7101	714.2126	826.3634	903.0322	903.5527	860.7572	785.8957	701.8907	593.7755	524.8791	502.8583	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	69.2827	69.4603	69.6388	70.5452	70.7293	71.6645	71.6645	71.8545	71.2875	70.7293	70.3620	69.9985	
alpha	5.6188	5.6307	5.6426	5.7030	5.7153	5.7776	5.7776	5.7903	5.7525	5.7153	5.6908	5.6666	
util living area	0.9910	0.9769	0.9390	0.8214	0.6351	0.4435	0.3214	0.3667	0.6060	0.8938	0.9792	0.9930	(86)
MIT	20.0451	20.2633	20.5442	20.8386	20.9667	20.9964	20.9995	20.9991	20.9809	20.7745	20.3586	20.0090	(87)
Th 2	20.1065	20.1086	20.1107	20.1212	20.1232	20.1337	20.1337	20.1358	20.1295	20.1232	20.1191	20.1149	(88)
util rest of house	0.9883	0.9705	0.9231	0.7847	0.5820	0.3845	0.2583	0.2982	0.5359	0.8605	0.9722	0.9909	(89)
MIT 2	19.0047	19.2806	19.6266	19.9705	20.0981	20.1318	20.1336	20.1355	20.1179	19.9127	19.4114	18.9653	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.4907	19.7396	20.0553	20.3760	20.5038	20.5357	20.5381	20.5389	20.5211	20.3153	19.8539	19.4529	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4907	19.7396	20.0553	20.3760	20.5038	20.5357	20.5381	20.5389	20.5211	20.3153	19.8539	19.4529	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9860	0.9673	0.9220	0.7959	0.6055	0.4120	0.2878	0.3302	0.5680	0.8685	0.9697	0.9889	(94)
Useful gains	521.5154	605.2496	658.5093	657.7169	546.7658	372.2357	247.7169	259.5113	398.7004	515.7159	508.9675	497.2853	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	988.9156	963.5890	877.9345	733.7187	561.4067	373.5710	247.8496	259.7978	406.2547	619.5294	817.5400	982.8077	(97)
Space heating kWh	347.7457	240.8041	163.2524	54.7213	10.8928	0.0000	0.0000	0.0000	0.0000	77.2372	222.1722	361.2287	(98a)
Space heating requirement - total per year (kWh/year)												1478.0544	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.7457	240.8041	163.2524	54.7213	10.8928	0.0000	0.0000	0.0000	0.0000	77.2372	222.1722	361.2287	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1478.0544	
Space heating per m2										(98c) / (4) =		22.0737	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	347.7457	240.8041	163.2524	54.7213	10.8928	0.0000	0.0000	0.0000	0.0000	77.2372	222.1722	361.2287	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	347.7457	240.8041	163.2524	54.7213	10.8928	0.0000	0.0000	0.0000	0.0000	77.2372	222.1722	361.2287	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.3942	9.3883	10.3942	10.0589	10.3942	10.0589	10.3942	10.3942	10.0589	10.3942	10.0589	10.3942	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1478.0544	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	122.3836	(230a)
Total electricity for the above, kWh/year	122.3836	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2375.2963	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1478.0544	0.1572	232.3844	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			319.5152	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			359.2237	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.3600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1478.0544	1.5820	2338.3104	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	1.5219	939.5420	(278)
Space and water heating			3277.8524	(279)
Pumps, fans and electric keep-hot	122.3836	1.5128	185.1419	(281)
Energy for lighting	157.5018	1.5338	241.5815	(282)
Total Primary energy kWh/year			3704.5759	(286)
Dwelling Primary energy Rate (DPER)			55.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.5500 (2b)	=	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1171	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3671	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3121	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.3979	0.3901	0.3823	0.3433	0.3355	0.2965	0.2965	0.2887	0.3121	0.3355	0.3511	0.3667	(22b)
Effective ac	0.5792	0.5761	0.5731	0.5589	0.5563	0.5439	0.5439	0.5417	0.5487	0.5563	0.5616	0.5672	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			14.6800	1.1450	16.8092			(27)
Exposed Floor			15.1200	0.1300	1.9656			(28b)
Brickwork	63.5900	16.7400	46.8500	0.1800	8.4330			(29a)
Communal Wall	15.0100		15.0100	0.1800	2.7018			(29a)
Total net area of external elements Aum(A, m2)			93.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.9696			(33)
Main dwelling								
Party Wall 1			30.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.4893 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	44.6800	0.0700	3.1276
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	8.7800	-0.0900	-0.7902
E18 Party wall between dwellings	11.7000	0.0600	0.7020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.0800	0.0500	0.5040
E4 Jamb	37.6900	0.0500	1.8845
E20 Exposed floor (normal)	6.9900	0.3200	2.2368
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6700	0.0200	0.0534
P7 Party Wall - Exposed floor (normal)	4.3300	0.1600	0.6928
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.3514 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.3210 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.6335	32.4603	32.2905	31.4932	31.3440	30.6495	30.6495	30.5209	30.9170	31.3440	31.6458	31.9613	(38)
Heat transfer coeff	73.9544	73.7813	73.6115	72.8141	72.6650	71.9705	71.9705	71.8419	72.2380	72.6650	72.9668	73.2823	(39)
Average = Sum(39)m / 12 =												72.8134	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1045	1.1019	1.0993	1.0874	1.0852	1.0748	1.0748	1.0729	1.0788	1.0852	1.0897	1.0944	(40)
HLP (average)												1.0874	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	242.4186	214.3957	227.6343	199.6478	193.2368	173.7866	171.1909	178.1211	180.2384	201.4005	214.6928	239.6911	(62)
WWHRS	-27.7063	-24.5036	-25.6588	-21.2465	-19.8010	-16.9438	-15.8821	-16.8891	-17.5307	-20.6668	-23.4130	-27.1932	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
										Total per year (kWh/year) = Sum(64)m =		2179.0197	(64)
12Total per year (kWh/year)												2179	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.3873	90.9616	97.4715	87.4633	86.0344	78.8645	78.7041	81.0084	81.0097	88.7488	92.4658	101.4804	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.9281	106.2061	95.9281	99.1257	95.9281	99.1257	95.9281	95.9281	99.1257	95.9281	99.1257	95.9281	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	137.6173	135.3596	131.0101	121.4769	115.6376	109.5340	105.7851	108.8822	112.5135	119.2860	128.4247	136.3984	(72)
Total internal gains													
	482.1978	492.1906	472.5921	455.6738	433.2782	414.8169	399.4826	400.6071	412.4070	429.5646	455.2597	472.5911	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.5100	10.6334	0.6300	0.7000	0.7700	17.9059	(74)
East	7.7000	19.6403	0.6300	0.7000	0.7700	46.2179	(76)
South	1.4700	46.7521	0.6300	0.7000	0.7700	21.0034	(78)

Solar gains	85.1271	159.0292	250.8593	360.0764	443.5539	456.7868	433.6422	369.6836	288.8549	185.1163	104.6136	71.0834	(83)
Total gains	567.3249	651.2198	723.4514	815.7502	876.8320	871.6037	833.1248	770.2907	701.2618	614.6809	559.8733	543.6745	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.9875	61.1307	61.2717	61.9426	62.0698	62.6687	62.6687	62.7809	62.4367	62.0698	61.8131	61.5470	
alpha	5.0658	5.0754	5.0848	5.1295	5.1380	5.1779	5.1779	5.1854	5.1624	5.1380	5.1209	5.1031	
util living area													
	0.9894	0.9780	0.9508	0.8673	0.7126	0.5191	0.3785	0.4260	0.6706	0.9101	0.9781	0.9913	(86)
MIT	19.8857	20.0883	20.3717	20.7120	20.9154	20.9864	20.9978	20.9961	20.9532	20.6742	20.2260	19.8530	(87)
Th 2	19.9972	19.9993	20.0014	20.0111	20.0129	20.0214	20.0214	20.0230	20.0182	20.0129	20.0092	20.0054	(88)
util rest of house													
	0.9862	0.9717	0.9367	0.8334	0.6538	0.4438	0.2952	0.3371	0.5902	0.8783	0.9705	0.9887	(89)
MIT 2	18.7209	18.9774	19.3297	19.7360	19.9473	20.0142	20.0208	20.0217	19.9891	19.7060	19.1610	18.6856	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.2650	19.4964	19.8165	20.1920	20.3995	20.4684	20.4772	20.4769	20.4395	20.1583	19.6585	19.2309	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2650	19.4964	19.8165	20.1920	20.3995	20.4684	20.4772	20.4769	20.4395	20.1583	19.6585	19.2309	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9677	0.9336	0.8401	0.6777	0.4786	0.3342	0.3787	0.6260	0.8836	0.9672	0.9860	(94)
Useful gains	557.7936	630.1911	675.4475	685.3436	594.2190	417.1796	278.3986	291.6811	438.9684	543.1544	541.5014	536.0734	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1106.7320	1076.9393	980.2440	822.2137	632.1518	422.3510	279.0433	292.8901	457.9511	694.5526	916.3554	1101.5007	(97)
Space heating kWh													
	408.4102	300.2148	226.7686	98.5464	28.2220	0.0000	0.0000	0.0000	0.0000	112.6403	269.8949	420.6779	(98a)
Space heating requirement - total per year (kWh/year)												1865.3752	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	408.4102	300.2148	226.7686	98.5464	28.2220	0.0000	0.0000	0.0000	0.0000	112.6403	269.8949	420.6779	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1865.3752	
Space heating per m2											(98c) / (4) =	27.8581	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	408.4102	300.2148	226.7686	98.5464	28.2220	0.0000	0.0000	0.0000	0.0000	112.6403	269.8949	420.6779	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	442.4813	325.2598	245.6865	106.7676	30.5764	0.0000	0.0000	0.0000	0.0000	122.0372	292.4105	455.7724	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4782	85.0821	84.3201	82.7856	80.9482	79.8000	79.8000	79.8000	79.8000	83.0310	84.8317	85.5615	(217)
Fuel for water heating, kWh/month													
	251.1897	223.1867	239.5343	215.4981	214.2554	196.5449	194.6225	202.0451	203.8943	217.6701	225.4815	248.3571	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9320	15.9902	14.3974	10.5481	8.1477	6.6567	7.4326	9.6612	12.5489	16.4648	18.5970	20.4859	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.9732	-26.6464	-40.2581	-47.6577	-53.5008	-50.7180	-50.1042	-46.2523	-39.8278	-31.5153	-20.2200	-15.3904	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.5375	-14.0493	-28.4829	-43.6093	-58.4788	-59.0518	-58.3524	-49.0281	-35.4450	-20.3565	-8.8131	-5.1475 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2020.9915 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2632.2795 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	160.8623 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-827.4164 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4072.7169 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2020.9915	0.2100	424.4082	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2632.2795	0.2100	552.7787	(264)
Space and water heating			977.1869	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.8623	0.1443	23.2174	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0642	0.1335	-58.7646	
PV Unit electricity exported	-387.3523	0.1253	-48.5504	
Total			-107.3150	(269)
Total CO2, kg/year			905.0186	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2020.9915	1.1300	2283.7204	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2632.2795	1.1300	2974.4759	(278)
Space and water heating			5258.1963	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.8623	1.5338	246.7360	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0642	1.4935	-657.2219	
PV Unit electricity exported	-387.3523	0.4601	-178.2030	
Total			-835.4249	(283)
Total Primary energy kWh/year			4799.6082	(286)
Target Primary Energy Rate (TPER)			71.6800	(287)

Full SAP Calculation Printout

Plot Reference	P-09	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-09
Plot Address	Flat 4, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.36	**TER**	13.52
Environmental	96 A	**% DER < TER**			60.36
CO_2 Emissions (t/year)	0.29	**DFEE**	39.18	**TFEE**	35.76
Compliance Check	See BREL	**% DFEE < TFEE**			-9.57
% DPER < TPER	22.82	**DPER**	55.33	**TPER**	71.68

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.5500	(2b) =	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1171	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7800	(17)
Infiltration rate		0.2561	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2177	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2776	0.2721	0.2667	0.2395	0.2340	0.2068	0.2068	0.2014	0.2177	0.2340	0.2449	0.2558	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5385	0.5370	0.5356	0.5287	0.5274	0.5214	0.5214	0.5203	0.5237	0.5274	0.5300	0.5327	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.5900	1.2357	16.7937			(27)
Exposed Floor			15.1200	0.1275	1.9279	110.0000	1663.2000	(28b)
Brickwork	63.5900	23.8200	39.7700	0.2100	8.3517	110.0000	4374.7000	(29a)
Communal Wall	15.0100		15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Total net area of external elements Aum(A, m2)			93.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2025			(33)
Main dwelling								
Party Wall 1			30.0000	0.0000	0.0000	110.0000	3300.0000	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			66.9600			30.0000	2008.8000	(32b)
Internal Wall 1			124.7200			9.0000	1122.4800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16237.0801 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		242.4893 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	44.6800	0.0380	1.6978	
E16 Corner (normal)	8.5500	0.0540	0.4617	
E17 Corner (inverted - internal area greater than external area)	8.7800	-0.0970	-0.8517	
E18 Party wall between dwellings	11.7000	0.0380	0.4446	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3900	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	10.0800	0.0500	0.5040	
E4 Jamb	37.6900	0.0160	0.6030	
E20 Exposed floor (normal)	6.9900	0.1200	0.8388	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6700	0.3300	0.8811	
P7 Party Wall - Exposed floor (normal)	4.3300	0.4800	2.0784	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.7462 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	48.9486 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.3442	30.2599	30.1773	29.7892	29.7166	29.3786	29.3786	29.3160	29.5088	29.7166	29.8635	30.0171	(38)
Heat transfer coeff	79.2929	79.2086	79.1259	78.7379	78.6652	78.3272	78.3272	78.2646	78.4574	78.6652	78.8121	78.9657	(39)
Average = Sum(39)m / 12 =												78.7375	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1842	1.1829	1.1817	1.1759	1.1748	1.1698	1.1698	1.1688	1.1717	1.1748	1.1770	1.1793	(40)
HLP (average)												1.1759	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 57.7819 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.0397	61.3107	59.4229	57.0730	54.9768	52.7982	52.3454	54.2293	56.1616	58.3988	60.7695	62.9512	(44)
Energy conte	99.8395	87.3056	91.3308	78.1301	74.0093	64.9216	63.3072	67.1472	69.2529	79.2467	86.5774	98.5664	(45)
Energy content (annual)										Total = Sum(45)m =		959.6345	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(64)
									Total per year (kWh/year) = Sum(64)m =			815.6894	(64)
12Total per year (kWh/year)												816	(64)
Electric shower(s)	48.5348	43.2449	47.2218	45.0632	45.9088	43.7925	45.2523	45.9088	45.0632	47.2218	46.3339	48.5348	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					552.0809	(64a)
Heat gains from water heating, kWh/month	33.3496	29.3637	31.2132	27.8684	27.2042	24.7440	24.7658	25.7460	25.9820	28.6454	29.9812	33.0791	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8839	106.1572	95.8839	99.0800	95.8839	99.0800	95.8839	95.8839	99.0800	95.8839	99.0800	95.8839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	44.8247	43.6959	41.9533	38.7062	36.5647	34.3666	33.2874	34.6048	36.0862	38.5018	41.6405	44.4611	(72)
Total internal gains	386.3610	397.4781	380.4912	369.8575	351.1612	339.6038	326.9408	326.2855	335.9340	345.7363	365.4298	377.6096	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	10.6334	0.3300	0.0000	0.7700	22.0749	(74)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)
South	2.1800	46.7521	0.3100	0.0000	0.7700	24.3282	(78)

Solar gains	99.8946	186.6704	294.7666	423.8373	522.9002	538.8835	511.4209	435.4348	339.6314	217.3572	122.7671	83.4134	(83)
Total gains	486.2556	584.1485	675.2578	793.6948	874.0614	878.4873	838.3617	761.7203	675.5654	563.0934	488.1969	461.0230	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.8815	56.9421	57.0015	57.2825	57.3354	57.5828	57.5828	57.6288	57.4872	57.3354	57.2285	57.1172	
alpha	4.7921	4.7961	4.8001	4.8188	4.8224	4.8389	4.8389	4.8419	4.8325	4.8224	4.8152	4.8078	
util living area	0.9948	0.9870	0.9661	0.8942	0.7473	0.5538	0.4078	0.4659	0.7261	0.9420	0.9886	0.9959	(86)
MIT	19.6305	19.8613	20.1931	20.6034	20.8721	20.9758	20.9955	20.9917	20.9169	20.5304	20.0000	19.5852	(87)
Th 2	19.9327	19.9337	19.9347	19.9393	19.9402	19.9443	19.9443	19.9450	19.9427	19.9402	19.9384	19.9366	(88)
util rest of house	0.9931	0.9830	0.9555	0.8635	0.6866	0.4695	0.3117	0.3625	0.6412	0.9178	0.9843	0.9946	(89)
MIT 2	18.6997	18.9287	19.2535	19.6393	19.8618	19.9342	19.9432	19.9428	19.9015	19.5844	19.0716	18.6578	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.1345	19.3644	19.6925	20.0897	20.3337	20.4208	20.4348	20.4328	20.3758	20.0263	19.5053	19.0910	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1345	19.3644	19.6925	20.0897	20.3337	20.4208	20.4348	20.4328	20.3758	20.0263	19.5053	19.0910	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9802	0.9526	0.8683	0.7104	0.5083	0.3567	0.4109	0.6779	0.9201	0.9820	0.9932	(94)
Useful gains	482.0930	572.5985	643.2310	689.2002	620.8966	446.5444	299.0212	313.0146	457.9956	518.1067	479.4155	457.9011	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1176.2720	1145.7019	1043.8659	881.0513	679.1742	455.9261	300.3671	315.6250	492.3862	741.5243	977.6870	1175.8794	(97)
Space heating kWh	516.4692	385.1255	298.0724	138.1328	43.3585	0.0000	0.0000	0.0000	0.0000	166.2227	358.7555	534.1759	(98a)
Space heating requirement - total per year (kWh/year)												2440.3124	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	516.4692	385.1255	298.0724	138.1328	43.3585	0.0000	0.0000	0.0000	0.0000	166.2227	358.7555	534.1759	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2440.3124	
Space heating per m2										(98c) / (4) =		36.4443	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	736.2759	579.6215	594.8112	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9259	0.9616	0.9411	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	681.7035	557.3689	559.7611	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	990.9973	945.9756	858.2519	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	222.6915	289.1234	222.0771	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.6729	72.2808	55.5193	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												183.4730	(107)
Energy for space heating												36.4443	(99)
Energy for space cooling												2.7400	(108)
Total												39.1844	(109)
Fabric Energy Efficiency (DFEE)												39.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.5500	(2b) =	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		170.7480	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

													Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												20.0000 / (5) =	0.1171	(8)
Pressure test													Yes	
Pressure Test Method													Blower Door	
Measured/design AP50													5.0000	(17)
Infiltration rate													0.3671	(18)
Number of sides sheltered													2	(19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3121	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3979	0.3901	0.3823	0.3433	0.3355	0.2965	0.2965	0.2887	0.3121	0.3355	0.3511	0.3667	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5792	0.5761	0.5731	0.5589	0.5563	0.5439	0.5439	0.5417	0.5487	0.5563	0.5616	0.5672	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			14.6800	1.1450	16.8092			(27)
Exposed Floor			15.1200	0.1300	1.9656			(28b)
Brickwork	63.5900	16.7400	46.8500	0.1800	8.4330			(29a)
Communal Wall	15.0100		15.0100	0.1800	2.7018			(29a)
Total net area of external elements Aum(A, m2)			93.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.9696			(33)
Main dwelling								
Party Wall 1			30.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.4893	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	44.6800	0.0700	3.1276
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	8.7800	-0.0900	-0.7902
E18 Party wall between dwellings	11.7000	0.0600	0.7020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.0800	0.0500	0.5040
E4 Jamb	37.6900	0.0500	1.8845
E20 Exposed floor (normal)	6.9900	0.3200	2.2368
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6700	0.0200	0.0534
P7 Party Wall - Exposed floor (normal)	4.3300	0.1600	0.6928
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.3514	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	41.3210	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.6335	32.4603	32.2905	31.4932	31.3440	30.6495	30.6495	30.5209	30.9170	31.3440	31.6458	31.9613	(38)
Heat transfer coeff	73.9544	73.7813	73.6115	72.8141	72.6650	71.9705	71.9705	71.8419	72.2380	72.6650	72.9668	73.2823	(39)
Average = Sum(39)m / 12 =												72.8134	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1045	1.1019	1.0993	1.0874	1.0852	1.0748	1.0748	1.0729	1.0788	1.0852	1.0897	1.0944	(40)
HLP (average)												1.0874	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1701	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day)	57.7819	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	63.0397	61.3107	59.4229	57.0730	54.9768	52.7982	52.3454	54.2293	56.1616	58.3988	60.7695	62.9512	(44)
Energy conte	99.8395	87.3056	91.3308	78.1301	74.0093	64.9216	63.3072	67.1472	69.2529	79.2467	86.5774	98.5664	(45)
Energy content (annual)											Total = Sum(45)m =	959.6345	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(64)
											Total per year (kWh/year) = Sum(64)m =	815.6894	(64)
12Total per year (kWh/year)												816	(64)
Electric shower(s)													
	48.5348	43.2449	47.2218	45.0632	45.9088	43.7925	45.2523	45.9088	45.0632	47.2218	46.3339	48.5348	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 552.0809 (64a)

Heat gains from water heating, kWh/month

	33.3496	29.3637	31.2132	27.8684	27.2042	24.7440	24.7658	25.7460	25.9820	28.6454	29.9812	33.0791 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	95.9281	106.2061	95.9281	99.1257	95.9281	99.1257	95.9281	95.9281	99.1257	95.9281	99.1257	95.9281	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)

Water heating gains (Table 5)

	44.8247	43.6959	41.9533	38.7062	36.5647	34.3666	33.2874	34.6048	36.0862	38.5018	41.6405	44.4611	(72)

Total internal gains

	386.4052	397.5270	380.5353	369.9031	351.2053	339.6495	326.9849	326.3297	335.9796	345.7804	365.4754	377.6538	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.5100	10.6334	0.6300	0.7000	0.7700	17.9059	(74)
East	7.7000	19.6403	0.6300	0.7000	0.7700	46.2179	(76)
South	1.4700	46.7521	0.6300	0.7000	0.7700	21.0034	(78)

Solar gains	85.1271	159.0292	250.8593	360.0764	443.5539	456.7868	433.6422	369.6836	288.8549	185.1163	104.6136	71.0834	(83)
Total gains	471.5323	556.5562	631.3946	729.9796	794.7592	796.4363	760.6272	696.0133	624.8345	530.8968	470.0891	448.7372	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.9875	61.1307	61.2717	61.9426	62.0698	62.6687	62.6687	62.7809	62.4367	62.0698	61.8131	61.5470	
alpha	5.0658	5.0754	5.0848	5.1295	5.1380	5.1779	5.1779	5.1854	5.1624	5.1380	5.1209	5.1031	
util living area	0.9953	0.9886	0.9705	0.9045	0.7625	0.5635	0.4137	0.4695	0.7309	0.9453	0.9894	0.9963	(86)
MIT	19.7335	19.9448	20.2474	20.6337	20.8842	20.9804	20.9967	20.9939	20.9306	20.5786	20.0893	19.7008	(87)
Th 2	19.9972	19.9993	20.0014	20.0111	20.0129	20.0214	20.0214	20.0230	20.0182	20.0129	20.0092	20.0054	(88)
util rest of house	0.9938	0.9850	0.9612	0.8767	0.7054	0.4836	0.3231	0.3725	0.6505	0.9228	0.9855	0.9951	(89)
MIT 2	18.8522	19.0630	19.3608	19.7306	19.9408	20.0131	20.0206	20.0214	19.9832	19.6908	19.2154	18.8261	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.2639	19.4749	19.7750	20.1525	20.3815	20.4650	20.4766	20.4757	20.4257	20.1055	19.6236	19.2347	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2639	19.4749	19.7750	20.1525	20.3815	20.4650	20.4766	20.4757	20.4257	20.1055	19.6236	19.2347	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9826	0.9587	0.8811	0.7278	0.5205	0.3655	0.4179	0.6856	0.9253	0.9836	0.9939	(94)
Useful gains	467.9188	546.8914	605.3185	643.1896	578.4372	414.5447	278.0172	290.8908	428.3940	491.2328	462.3684	446.0088	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1106.6494	1075.3566	977.1902	819.3375	630.8413	422.1043	279.0006	292.8034	456.9586	690.7178	913.8085	1101.7760	(97)
Space heating kWh	475.2156	355.1286	276.6725	126.8265	38.9887	0.0000	0.0000	0.0000	0.0000	148.4168	325.0369	487.8908	(98a)
Space heating requirement - total per year (kWh/year)												2234.1766	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	475.2156	355.1286	276.6725	126.8265	38.9887	0.0000	0.0000	0.0000	0.0000	148.4168	325.0369	487.8908	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2234.1766	
Space heating per m2											(98c) / (4) =	33.3658	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	676.5225	532.5816	545.9982	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9303	0.9657	0.9473	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	629.3907	514.2923	517.2296	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	895.0440	855.0697	781.4053	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	191.2704	253.5384	196.5467	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	47.8176	63.3846	49.1367	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												160.3389	(107)
Energy for space heating												33.3658	(99)
Energy for space cooling												2.3945	(108)

Total	35.7604 (109)
Fabric Energy Efficiency (TFEE)	35.8 (109)

Full SAP Calculation Printout

Plot Reference	P-09	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-09
Plot Address	Flat 4, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.36	**TER**	13.52
Environmental	96 A	**% DER < TER**			60.36
CO_2 Emissions (t/year)	0.29	**DFEE**	39.18	**TFEE**	35.76
Compliance Check	See BREL	**% DFEE < TFEE**			-9.57
% DPER < TPER	22.82	**DPER**	55.33	**TPER**	71.68

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.5500 (2b)	=	170.7480	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7800	(17)
Infiltration rate		0.1390	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1181	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1506	0.1477	0.1447	0.1300	0.1270	0.1122	0.1122	0.1093	0.1181	0.1270	0.1329	0.1388	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2866	0.2837	0.2807	0.2660	0.2630	0.2482	0.2482	0.2453	0.2541	0.2630	0.2689	0.2748	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.5900	1.2357	16.7937			(27)
Exposed Floor			15.1200	0.1275	1.9279	110.0000	1663.2000	(28b)
Brickwork	63.5900	23.8200	39.7700	0.2100	8.3517	110.0000	4374.7000	(29a)
Communal Wall	15.0100		15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Total net area of external elements Aum(A, m2)			93.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2025			(33)
Main dwelling								
Party Wall 1			30.0000	0.0000	0.0000	110.0000	3300.0000	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			66.9600			30.0000	2008.8000	(32b)
Internal Wall 1			124.7200			9.0000	1122.4800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16237.0801	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.4893 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E7 Party floor between dwellings (in blocks of flats)	44.6800	0.0380	1.6978
	E16 Corner (normal)	8.5500	0.0540	0.4617
	E17 Corner (inverted - internal area greater than external area)	8.7800	-0.0970	-0.8517
	E18 Party wall between dwellings	11.7000	0.0380	0.4446
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3900	0.0000	0.0000
	E2 Other lintels (including other steel lintels)	10.0800	0.0500	0.5040
	E4 Jamb	37.6900	0.0160	0.6030
	E20 Exposed floor (normal)	6.9900	0.1200	0.8388
	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6700	0.3300	0.8811
	P7 Party Wall - Exposed floor (normal)	4.3300	0.4800	2.0784
	E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7462 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 48.9486 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.1513	15.9849	15.8185	14.9863	14.8199	13.9877	13.9877	13.8212	14.3205	14.8199	15.1527	15.4856	(38)
Heat transfer coeff	65.1000	64.9335	64.7671	63.9349	63.7685	62.9363	62.9363	62.7699	63.2692	63.7685	64.1013	64.4342	(39)

Average = Sum(39)m / 12 = 63.8933

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9722	0.9697	0.9673	0.9548	0.9523	0.9399	0.9399	0.9374	0.9449	0.9523	0.9573	0.9623	(40)
HLP (average)												0.9542	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)

Energy content (annual) Total = Sum(45)m = 1887.8373

Distribution loss (46)m = 0.15 x (45)m

29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)

Total per year (kWh/year) = Sum(64)m = 2232.7623 (64)

12Total per year (kWh/year) 2233 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8839	106.1572	95.8839	99.0800	95.8839	99.0800	95.8839	95.8839	99.0800	95.8839	99.0800	95.8839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains	429.0515	439.0397	419.4459	402.5261	380.1320	364.6692	349.3364	350.4609	362.2593	376.4184	402.1120	419.4449	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	10.6334	0.3300	0.0000	0.7700	22.0749	(74)

East			11.4100		19.6403		0.3100		0.0000		0.7700		53.4916 (76)
South			2.1800		46.7521		0.3100		0.0000		0.7700		24.3282 (78)
Solar gains	99.8946	186.6704	294.7666	423.8373	522.9002	538.8835	511.4209	435.4348	339.6314	217.3572	122.7671	83.4134	(83)
Total gains	528.9462	625.7101	714.2126	826.3634	903.0322	903.5527	860.7572	785.8957	701.8907	593.7755	524.8791	502.8583	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	69.2827	69.4603	69.6388	70.5452	70.7293	71.6645	71.6645	71.8545	71.2875	70.7293	70.3620	69.9985	
alpha	5.6188	5.6307	5.6426	5.7030	5.7153	5.7776	5.7776	5.7903	5.7525	5.7153	5.6908	5.6666	
util living area	0.9910	0.9769	0.9390	0.8214	0.6351	0.4435	0.3214	0.3667	0.6060	0.8938	0.9792	0.9930	(86)
MIT	20.0451	20.2633	20.5442	20.8386	20.9667	20.9964	20.9995	20.9991	20.9809	20.7745	20.3586	20.0090	(87)
Th 2	20.1065	20.1086	20.1107	20.1212	20.1232	20.1337	20.1337	20.1358	20.1295	20.1232	20.1191	20.1149	(88)
util rest of house	0.9883	0.9705	0.9231	0.7847	0.5820	0.3845	0.2583	0.2982	0.5359	0.8605	0.9722	0.9909	(89)
MIT 2	19.0047	19.2806	19.6266	19.9705	20.0981	20.1318	20.1336	20.1355	20.1179	19.9127	19.4114	18.9653	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.4907	19.7396	20.0553	20.3760	20.5038	20.5357	20.5381	20.5389	20.5211	20.3153	19.8539	19.4529	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4907	19.7396	20.0553	20.3760	20.5038	20.5357	20.5381	20.5389	20.5211	20.3153	19.8539	19.4529	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9860	0.9673	0.9220	0.7959	0.6055	0.4120	0.2878	0.3302	0.5680	0.8685	0.9697	0.9889	(94)
Useful gains	521.5154	605.2496	658.5093	657.7169	546.7658	372.2357	247.7169	259.5113	398.7004	515.7159	508.9675	497.2853	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	988.9156	963.5890	877.9345	733.7187	561.4067	373.5710	247.8496	259.7978	406.2547	619.5294	817.5400	982.8077	(97)
Space heating kWh	347.7457	240.8041	163.2524	54.7213	10.8928	0.0000	0.0000	0.0000	0.0000	77.2372	222.1722	361.2287	(98a)
Space heating requirement - total per year (kWh/year)												1478.0544	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.7457	240.8041	163.2524	54.7213	10.8928	0.0000	0.0000	0.0000	0.0000	77.2372	222.1722	361.2287	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1478.0544	
Space heating per m2										(98c) / (4) =		22.0737	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	347.7457	240.8041	163.2524	54.7213	10.8928	0.0000	0.0000	0.0000	0.0000	77.2372	222.1722	361.2287	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	347.7457	240.8041	163.2524	54.7213	10.8928	0.0000	0.0000	0.0000	0.0000	77.2372	222.1722	361.2287	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.3942	9.3883	10.3942	10.0589	10.3942	10.0589	10.3942	10.3942	10.0589	10.3942	10.0589	10.3942	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1478.0544	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	122.3836	(230a)
Total electricity for the above, kWh/year	122.3836	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2375.2963	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1478.0544	0.1572	232.3844	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			319.5152	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			359.2237	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.3600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1478.0544	1.5820	2338.3104	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	1.5219	939.5420	(278)
Space and water heating			3277.8524	(279)
Pumps, fans and electric keep-hot	122.3836	1.5128	185.1419	(281)
Energy for lighting	157.5018	1.5338	241.5815	(282)
Total Primary energy kWh/year			3704.5759	(286)
Dwelling Primary energy Rate (DPER)			55.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.5500 (2b)	=	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1171	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3671	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3121	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.3979	0.3901	0.3823	0.3433	0.3355	0.2965	0.2965	0.2887	0.3121	0.3355	0.3511	0.3667	(22b)
Effective ac	0.5792	0.5761	0.5731	0.5589	0.5563	0.5439	0.5439	0.5417	0.5487	0.5563	0.5616	0.5672	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			14.6800	1.1450	16.8092			(27)
Exposed Floor			15.1200	0.1300	1.9656			(28b)
Brickwork	63.5900	16.7400	46.8500	0.1800	8.4330			(29a)
Communal Wall	15.0100		15.0100	0.1800	2.7018			(29a)
Total net area of external elements Aum(A, m2)			93.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.9696			(33)
Main dwelling								
Party Wall 1			30.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.4893 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	44.6800	0.0700	3.1276
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	8.7800	-0.0900	-0.7902
E18 Party wall between dwellings	11.7000	0.0600	0.7020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.0800	0.0500	0.5040
E4 Jamb	37.6900	0.0500	1.8845
E20 Exposed floor (normal)	6.9900	0.3200	2.2368
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6700	0.0200	0.0534
P7 Party Wall - Exposed floor (normal)	4.3300	0.1600	0.6928
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.3514 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.3210 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.6335	32.4603	32.2905	31.4932	31.3440	30.6495	30.6495	30.5209	30.9170	31.3440	31.6458	31.9613	(38)
Heat transfer coeff	73.9544	73.7813	73.6115	72.8141	72.6650	71.9705	71.9705	71.8419	72.2380	72.6650	72.9668	73.2823	(39)
Average = Sum(39)m / 12 =												72.8134	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1045	1.1019	1.0993	1.0874	1.0852	1.0748	1.0748	1.0729	1.0788	1.0852	1.0897	1.0944	(40)
HLP (average)												1.0874	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	242.4186	214.3957	227.6343	199.6478	193.2368	173.7866	171.1909	178.1211	180.2384	201.4005	214.6928	239.6911	(62)
WWHRS	-27.7063	-24.5036	-25.6588	-21.2465	-19.8010	-16.9438	-15.8821	-16.8891	-17.5307	-20.6668	-23.4130	-27.1932	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
										Total per year (kWh/year) = Sum(64)m =		2179.0197	(64)
12Total per year (kWh/year)												2179	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.3873	90.9616	97.4715	87.4633	86.0344	78.8645	78.7041	81.0084	81.0097	88.7488	92.4658	101.4804	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.9281	106.2061	95.9281	99.1257	95.9281	99.1257	95.9281	95.9281	99.1257	95.9281	99.1257	95.9281	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	137.6173	135.3596	131.0101	121.4769	115.6376	109.5340	105.7851	108.8822	112.5135	119.2860	128.4247	136.3984	(72)
Total internal gains													
	482.1978	492.1906	472.5921	455.6738	433.2782	414.8169	399.4826	400.6071	412.4070	429.5646	455.2597	472.5911	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.5100	10.6334	0.6300	0.7000	0.7700	17.9059	(74)
East	7.7000	19.6403	0.6300	0.7000	0.7700	46.2179	(76)
South	1.4700	46.7521	0.6300	0.7000	0.7700	21.0034	(78)

Solar gains	85.1271	159.0292	250.8593	360.0764	443.5539	456.7868	433.6422	369.6836	288.8549	185.1163	104.6136	71.0834	(83)
Total gains	567.3249	651.2198	723.4514	815.7502	876.8320	871.6037	833.1248	770.2907	701.2618	614.6809	559.8733	543.6745	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.9875	61.1307	61.2717	61.9426	62.0698	62.6687	62.6687	62.7809	62.4367	62.0698	61.8131	61.5470	
alpha	5.0658	5.0754	5.0848	5.1295	5.1380	5.1779	5.1779	5.1854	5.1624	5.1380	5.1209	5.1031	
util living area													
	0.9894	0.9780	0.9508	0.8673	0.7126	0.5191	0.3785	0.4260	0.6706	0.9101	0.9781	0.9913	(86)
MIT	19.8857	20.0883	20.3717	20.7120	20.9154	20.9864	20.9978	20.9961	20.9532	20.6742	20.2260	19.8530	(87)
Th 2	19.9972	19.9993	20.0014	20.0111	20.0129	20.0214	20.0214	20.0230	20.0182	20.0129	20.0092	20.0054	(88)
util rest of house													
	0.9862	0.9717	0.9367	0.8334	0.6538	0.4438	0.2952	0.3371	0.5902	0.8783	0.9705	0.9887	(89)
MIT 2	18.7209	18.9774	19.3297	19.7360	19.9473	20.0142	20.0208	20.0217	19.9891	19.7060	19.1610	18.6856	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.2650	19.4964	19.8165	20.1920	20.3995	20.4684	20.4772	20.4769	20.4395	20.1583	19.6585	19.2309	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2650	19.4964	19.8165	20.1920	20.3995	20.4684	20.4772	20.4769	20.4395	20.1583	19.6585	19.2309	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9677	0.9336	0.8401	0.6777	0.4786	0.3342	0.3787	0.6260	0.8836	0.9672	0.9860	(94)
Useful gains	557.7936	630.1911	675.4475	685.3436	594.2190	417.1796	278.3986	291.6811	438.9684	543.1544	541.5014	536.0734	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1106.7320	1076.9393	980.2440	822.2137	632.1518	422.3510	279.0433	292.8901	457.9511	694.5526	916.3554	1101.5007	(97)
Space heating kWh													
	408.4102	300.2148	226.7686	98.5464	28.2220	0.0000	0.0000	0.0000	0.0000	112.6403	269.8949	420.6779	(98a)
Space heating requirement - total per year (kWh/year)												1865.3752	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	408.4102	300.2148	226.7686	98.5464	28.2220	0.0000	0.0000	0.0000	0.0000	112.6403	269.8949	420.6779	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1865.3752	
Space heating per m2											(98c) / (4) =	27.8581	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	408.4102	300.2148	226.7686	98.5464	28.2220	0.0000	0.0000	0.0000	0.0000	112.6403	269.8949	420.6779	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	442.4813	325.2598	245.6865	106.7676	30.5764	0.0000	0.0000	0.0000	0.0000	122.0372	292.4105	455.7724	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4782	85.0821	84.3201	82.7856	80.9482	79.8000	79.8000	79.8000	79.8000	83.0310	84.8317	85.5615	(217)
Fuel for water heating, kWh/month													
	251.1897	223.1867	239.5343	215.4981	214.2554	196.5449	194.6225	202.0451	203.8943	217.6701	225.4815	248.3571	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9320	15.9902	14.3974	10.5481	8.1477	6.6567	7.4326	9.6612	12.5489	16.4648	18.5970	20.4859	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.9732	-26.6464	-40.2581	-47.6577	-53.5008	-50.7180	-50.1042	-46.2523	-39.8278	-31.5153	-20.2200	-15.3904	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.5375	-14.0493	-28.4829	-43.6093	-58.4788	-59.0518	-58.3524	-49.0281	-35.4450	-20.3565	-8.8131	-5.1475 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2020.9915 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2632.2795 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	160.8623 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-827.4164 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4072.7169 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2020.9915	0.2100	424.4082	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2632.2795	0.2100	552.7787	(264)
Space and water heating			977.1869	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.8623	0.1443	23.2174	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0642	0.1335	-58.7646	
PV Unit electricity exported	-387.3523	0.1253	-48.5504	
Total			-107.3150	(269)
Total CO2, kg/year			905.0186	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2020.9915	1.1300	2283.7204	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2632.2795	1.1300	2974.4759	(278)
Space and water heating			5258.1963	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.8623	1.5338	246.7360	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0642	1.4935	-657.2219	
PV Unit electricity exported	-387.3523	0.4601	-178.2030	
Total			-835.4249	(283)
Total Primary energy kWh/year			4799.6082	(286)
Target Primary Energy Rate (TPER)			71.6800	(287)

Full SAP Calculation Printout

Plot Reference	P-09	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-09
Plot Address	Flat 4, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.36	**TER**	13.52
Environmental	96 A	**% DER < TER**			60.36
CO_2 Emissions (t/year)	0.29	**DFEE**	39.18	**TFEE**	35.76
Compliance Check	See BREL	**% DFEE < TFEE**			-9.57
% DPER < TPER	22.82	**DPER**	55.33	**TPER**	71.68

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.5500	(2b) =	170.7480	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7800 (17)
Infiltration rate		0.1390 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1181 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1506	0.1477	0.1447	0.1300	0.1270	0.1122	0.1122	0.1093	0.1181	0.1270	0.1329	0.1388	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2866	0.2837	0.2807	0.2660	0.2630	0.2482	0.2482	0.2453	0.2541	0.2630	0.2689	0.2748	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.5900	1.2357	16.7937			(27)
Exposed Floor			15.1200	0.1275	1.9279	110.0000	1663.2000	(28b)
Brickwork	63.5900	23.8200	39.7700	0.2100	8.3517	110.0000	4374.7000	(29a)
Communal Wall	15.0100		15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Total net area of external elements Aum(A, m2)			93.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2025			(33)
Main dwelling								
Party Wall 1			30.0000	0.0000	0.0000	110.0000	3300.0000	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			66.9600			30.0000	2008.8000	(32b)
Internal Wall 1			124.7200			9.0000	1122.4800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16237.0801	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.4893 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E7 Party floor between dwellings (in blocks of flats)	44.6800	0.0380	1.6978
	E16 Corner (normal)	8.5500	0.0540	0.4617
	E17 Corner (inverted - internal area greater than external area)	8.7800	-0.0970	-0.8517
	E18 Party wall between dwellings	11.7000	0.0380	0.4446
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3900	0.0000	0.0000
	E2 Other lintels (including other steel lintels)	10.0800	0.0500	0.5040
	E4 Jamb	37.6900	0.0160	0.6030
	E20 Exposed floor (normal)	6.9900	0.1200	0.8388
	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6700	0.3300	0.8811
	P7 Party Wall - Exposed floor (normal)	4.3300	0.4800	2.0784
	E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7462 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 48.9486 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.1513	15.9849	15.8185	14.9863	14.8199	13.9877	13.9877	13.8212	14.3205	14.8199	15.1527	15.4856	(38)
Heat transfer coeff	65.1000	64.9335	64.7671	63.9349	63.7685	62.9363	62.9363	62.7699	63.2692	63.7685	64.1013	64.4342	(39)

Average = Sum(39)m / 12 = 63.8933

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9722	0.9697	0.9673	0.9548	0.9523	0.9399	0.9399	0.9374	0.9449	0.9523	0.9573	0.9623	(40)
HLP (average)												0.9542	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)
Hot water usage for baths	26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)
Hot water usage for other uses	36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)

Energy content (annual) Total = Sum(45)m = 1887.8373

Distribution loss (46)m = 0.15 x (45)m

	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)

Total per year (kWh/year) = Sum(64)m = 2232.7623 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	10.6334	0.3300	0.0000	0.7700	22.0749	(74)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)

South			2.1800		46.7521		0.3100		0.0000		0.7700		24.3282 (78)
Solar gains	99.8946	186.6704	294.7666	423.8373	522.9002	538.8835	511.4209	435.4348	339.6314	217.3572	122.7671	83.4134	(83)
Total gains	587.0314	672.0007	764.6299	864.4598	934.6665	924.3873	881.2764	807.9361	726.8816	631.0874	568.6530	557.4318	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.2827	69.4603	69.6388	70.5452	70.7293	71.6645	71.6645	71.8545	71.2875	70.7293	70.3620	69.9985	
alpha	5.6188	5.6307	5.6426	5.7030	5.7153	5.7776	5.7776	5.7903	5.7525	5.7153	5.6908	5.6666	
util living area													
	0.9853	0.9687	0.9218	0.7998	0.6164	0.4337	0.3140	0.3568	0.5874	0.8714	0.9704	0.9886	(86)
MIT	20.1371	20.3306	20.6022	20.8601	20.9712	20.9968	20.9996	20.9992	20.9836	20.8071	20.4231	20.0969	(87)
Th 2	20.1065	20.1086	20.1107	20.1212	20.1232	20.1337	20.1337	20.1358	20.1295	20.1232	20.1191	20.1149	(88)
util rest of house													
	0.9812	0.9603	0.9028	0.7616	0.5641	0.3759	0.2523	0.2901	0.5186	0.8342	0.9611	0.9853	(89)
MIT 2	19.1206	19.3635	19.6941	19.9922	20.1017	20.1320	20.1336	20.1355	20.1197	19.9467	19.4904	19.0764	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	19.5955	19.8153	20.1183	20.3976	20.5079	20.5360	20.5381	20.5390	20.5233	20.3486	19.9261	19.5531	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5955	19.8153	20.1183	20.3976	20.5079	20.5360	20.5381	20.5390	20.5233	20.3486	19.9261	19.5531	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9783	0.9571	0.9030	0.7742	0.5874	0.4029	0.2811	0.3213	0.5502	0.8446	0.9587	0.9827	(94)
Useful gains	574.2713	643.1715	690.4443	669.2341	549.0505	372.4005	247.7348	259.5557	399.9483	533.0183	545.1445	547.7909	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	995.7335	968.5007	882.0201	735.0981	561.6651	373.5895	247.8517	259.8030	406.3952	621.6556	822.1713	989.2678	(97)
Space heating kWh													
	313.5679	218.6213	142.5324	47.4221	9.3853	0.0000	0.0000	0.0000	0.0000	65.9461	199.4593	328.4588	(98a)
Space heating requirement - total per year (kWh/year)												1325.3932	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	313.5679	218.6213	142.5324	47.4221	9.3853	0.0000	0.0000	0.0000	0.0000	65.9461	199.4593	328.4588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1325.3932	
Space heating per m2											(98c) / (4) =	19.7938	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	313.5679	218.6213	142.5324	47.4221	9.3853	0.0000	0.0000	0.0000	0.0000	65.9461	199.4593	328.4588	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	313.5679	218.6213	142.5324	47.4221	9.3853	0.0000	0.0000	0.0000	0.0000	65.9461	199.4593	328.4588	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.3942	9.3883	10.3942	10.0589	10.3942	10.0589	10.3942	10.3942	10.0589	10.3942	10.0589	10.3942	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1325.3932	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	122.3836	(230a)
Total electricity for the above, kWh/year	122.3836	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2222.6351	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1325.3932	16.4900	218.5573	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	16.4900	101.8021	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	122.3836	16.4900	20.1811	(249)
Energy for lighting	157.5018	16.4900	25.9720	(250)
Additional standing charges			0.0000	(251)
Total energy cost			366.5125	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1785	(257)
SAP value		80.8966	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1325.3932	0.1573	208.5445	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			295.6753	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			335.3838	(272)
CO2 emissions per m2			5.0100	(273)
EI value			95.9859	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b) x	2.5500	(2b) =	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 66.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		170.7480	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.7800	(17)
Infiltration rate	0.1390	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1181	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1270	0.1211	0.1211	0.1122	0.1152	0.1004	0.1004	0.0975	0.1004	0.1122	0.1093	0.1181	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2630	0.2571	0.2571	0.2482	0.2512	0.2364	0.2364	0.2335	0.2364	0.2482	0.2453	0.2541	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.5900	1.2357	16.7937			(27)
Exposed Floor			15.1200	0.1275	1.9279	110.0000	1663.2000	(28b)
Brickwork	63.5900	23.8200	39.7700	0.2100	8.3517	110.0000	4374.7000	(29a)
Communal Wall	15.0100		15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Total net area of external elements Aum(A, m2)			93.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2025			(33)
Main dwelling								
Party Wall 1			30.0000	0.0000	0.0000	110.0000	3300.0000	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			66.9600			30.0000	2008.8000	(32b)
Internal Wall 1			124.7200			9.0000	1122.4800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16237.0801	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.4893	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	44.6800	0.0380	1.6978
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	8.7800	-0.0970	-0.8517
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.0800	0.0500	0.5040
E4 Jamb	37.6900	0.0160	0.6030
E20 Exposed floor (normal)	6.9900	0.1200	0.8388
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6700	0.3300	0.8811
P7 Party Wall - Exposed floor (normal)	4.3300	0.4800	2.0784
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.7462	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 48.9486	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.8199	14.4870	14.4870	13.9877	14.1541	13.3219	13.3219	13.1555	13.3219	13.9877	13.8212	14.3205	(38)
Heat transfer coeff	63.7685	63.4356	63.4356	62.9363	63.1027	62.2706	62.2706	62.1041	62.2706	62.9363	62.7699	63.2692	(39)
Average = Sum(39)m / 12 =												62.8808	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9523	0.9474	0.9474	0.9399	0.9424	0.9300	0.9300	0.9275	0.9300	0.9399	0.9374	0.9449	(40)
HLP (average)												0.9391	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1701	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)
Hot water usage for baths	26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)
Hot water usage for other uses	36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)
Average daily hot water use (litres/day)												113.6581	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
									Total per year (kWh/year) = Sum(64)m =			2232.7623	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	12.7650	0.3300	0.0000	0.7700	26.5002	(74)
East	11.4100	23.8018	0.3100	0.0000	0.7700	64.8257	(76)
South	2.1800	54.2217	0.3100	0.0000	0.7700	28.2151	(78)

Solar gains	119.5410	195.6950	307.7746	450.3523	541.7219	590.5450	554.9361	484.2805	378.4539	244.8816	144.8304	100.3235	(83)
Total gains	606.6777	681.0253	777.6378	890.9748	953.4882	976.0489	924.7916	856.7819	765.7040	658.6119	590.7163	574.3419	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.7293	71.1004	71.1004	71.6645	71.4755	72.4307	72.4307	72.6248	72.4307	71.6645	71.8545	71.2875	
alpha	5.7153	5.7400	5.7400	5.7776	5.7650	5.8287	5.8287	5.8417	5.8287	5.7776	5.7903	5.7525	
util living area	0.9780	0.9570	0.8920	0.7327	0.5291	0.3314	0.2222	0.2464	0.4841	0.8083	0.9521	0.9825	(86)
MIT	20.2839	20.4566	20.7119	20.9218	20.9887	20.9994	21.0000	20.9999	20.9950	20.8881	20.5670	20.2469	(87)
Th 2	20.1232	20.1274	20.1274	20.1337	20.1316	20.1421	20.1421	20.1442	20.1421	20.1337	20.1358	20.1295	(88)
util rest of house	0.9717	0.9457	0.8671	0.6883	0.4750	0.2769	0.1644	0.1844	0.4167	0.7598	0.9374	0.9775	(89)
MIT 2	19.3182	19.5344	19.8364	20.0663	20.1241	20.1419	20.1421	20.1442	20.1396	20.0396	19.6799	19.2773	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	19.7693	19.9652	20.2454	20.4659	20.5280	20.5425	20.5428	20.5439	20.5392	20.4360	20.0943	19.7302	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7693	19.9652	20.2454	20.4659	20.5280	20.5425	20.5428	20.5439	20.5392	20.4360	20.0943	19.7302	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9687	0.9432	0.8708	0.7059	0.4999	0.3024	0.1914	0.2134	0.4481	0.7777	0.9365	0.9746	(94)
Useful gains	587.6931	642.3738	677.1557	628.8996	476.6700	295.1216	177.0160	182.8136	343.1030	512.1930	553.2285	559.7629	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	935.4388	904.9223	814.8559	664.9814	481.3486	295.3155	177.0253	182.8309	344.9266	562.3982	759.1599	925.6433	(97)
Space heating kWh	258.7228	176.4326	102.4489	25.9788	3.4809	0.0000	0.0000	0.0000	0.0000	37.3527	148.2707	272.2150	(98a)
Space heating requirement - total per year (kWh/year)												1024.9024	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	258.7228	176.4326	102.4489	25.9788	3.4809	0.0000	0.0000	0.0000	0.0000	37.3527	148.2707	272.2150	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1024.9024	
Space heating per m2											(98c) / (4) =	15.3062	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

```
Space heating requirement
            258.7228   176.4326   102.4489    25.9788     3.4809     0.0000     0.0000     0.0000     0.0000    37.3527   148.2707   272.2150 (98)
Space heating efficiency (main heating system 1)
            100.0000   100.0000   100.0000   100.0000   100.0000     0.0000     0.0000     0.0000     0.0000   100.0000   100.0000   100.0000 (210)
Space heating fuel (main heating system)
            258.7228   176.4326   102.4489    25.9788     3.4809     0.0000     0.0000     0.0000     0.0000    37.3527   148.2707   272.2150 (211)
Space heating efficiency (main heating system 2)
              0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (212)
Space heating fuel (main heating system 2)
              0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (213)
Space heating fuel (secondary)
              0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (215)
Space heating fuel used, main system 2                                                                                                  0.0000 (213)

Water heating
Water heating requirement
            225.1187   198.7700   210.3344   182.9060   175.9369   157.0448   153.8910   160.8212   163.4966   184.1006   197.9510   222.3912 (64)
Efficiency of water heater                                                                                                              361.6650 (216)
(217)m      361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650 (217)
Fuel for water heating, kWh/month
             62.2451    54.9597    58.1572    50.5733    48.6464    43.4227    42.5507    44.4669    45.2066    50.9036    54.7332    61.4909 (219)
Space cooling fuel requirement
(221)m        0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (221)
Pumps and Fa  10.3942     9.3883    10.3942    10.0589    10.3942    10.0589    10.3942    10.3942    10.0589    10.3942    10.0589    10.3942 (231)
Lighting      19.5156    15.6561    14.0966    10.3278     7.9775     6.5177     7.2773     9.4593    12.2867    16.1209    18.2085    20.0580 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1                                                                                                   1024.9024 (211)
Space heating fuel - main system 2                                                                                                      0.0000 (213)
Space heating fuel - secondary                                                                                                          0.0000 (215)
Efficiency of water heater                                                                                                            361.6650
Water heating fuel used                                                                                                              617.3565 (219)
Space cooling fuel                                                                                                                      0.0000 (221)

Electricity for pumps and fans:
    (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
   mechanical ventilation fans (SFP =       0.5875)                                                                                   122.3836 (230a)
Total electricity for the above, kWh/year                                                                                            122.3836 (231)
Electricity for lighting (calculated in Appendix L)                                                                                  157.5018 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation                                                                                                                           0.0000 (233)
Wind generation                                                                                                                         0.0000 (234)
Hydro-electric generation (Appendix N)                                                                                                  0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)                                                                                          0.0000 (235)
Appendix Q - special features
Energy saved or generated                                                                                                              -0.0000 (236)
Energy used                                                                                                                             0.0000 (237)
Total delivered energy for all uses                                                                                                  1922.1443 (238)



-------------------------------------------------------------------------------------------------------------
10a. Fuel costs - using BEDF prices (593)
-------------------------------------------------------------------------------------------------------------
                                                                  Fuel          Fuel price            Fuel cost
                                                               kWh/year             p/kWh             £/year
Space heating - main system 1                                1024.9024            27.6700           283.5905 (240)
Space heating - main system 2                                   0.0000            27.6700             0.0000 (241)
Total CO2 associated with community systems                                                               0.0000 (473)
Water heating (other fuel)                                    617.3565            27.6700           170.8225 (247)
Energy for instantaneous electric shower(s)                     0.0000            27.6700             0.0000 (247a)
Pumps, fans and electric keep-hot                             122.3836            27.6700            33.8635 (249)
Energy for lighting                                           157.5018            27.6700            43.5808 (250)
Additional standing charges                                                                               0.0000 (251)
Total energy cost                                                                                       531.8573 (255)



-------------------------------------------------------------------------------------------------------------
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP
-------------------------------------------------------------------------------------------------------------
                                                                  Energy  Emission factor           Emissions
                                                               kWh/year       kg CO2/kWh         kg CO2/year
Space heating - main system 1                                1024.9024           0.1582           162.0900 (261)
Space heating - main system 2                                   0.0000           0.0000             0.0000 (262)
Total CO2 associated with community systems                                                               0.0000 (373)
Water heating (other fuel)                                    617.3565           0.1411            87.1309 (264)
Space and water heating                                                                                 249.2209 (265)
Pumps, fans and electric keep-hot                             122.3836           0.1387            16.9761 (267)
Energy for lighting                                           157.5018           0.1443            22.7324 (268)
Total CO2, kg/year                                                                                      288.9294 (272)



-------------------------------------------------------------------------------------------------------------
13a. Primary energy - Individual heating systems including micro-CHP
-------------------------------------------------------------------------------------------------------------
                                                                  Energy Primary energy factor  Primary energy
                                                               kWh/year       kg CO2/kWh         kWh/year
Space heating - main system 1                                1024.9024           1.5854         1624.9116 (275)
Space heating - main system 2                                   0.0000           0.0000             0.0000 (276)
Total CO2 associated with community systems                                                               0.0000 (473)
Water heating (other fuel)                                    617.3565           1.5219          939.5420 (278)
Space and water heating                                                                                2564.4536 (279)
Pumps, fans and electric keep-hot                             122.3836           1.5128          185.1419 (281)
```

Energy for lighting	157.5018	1.5338	241.5815 (282)
Total Primary energy kWh/year			2991.1771 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating			Not applicable
U Solar photovoltaic panels			Not applicable
V2 Wind turbine			Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£532	£532	£0
Space heating	£317	£317	£0
Water heating	£171	£171	£0
Lighting	£44	£44	£0
Total cost of fuels	£532	£532	£0
Total cost of uses	£532	£532	£0
Delivered energy	29 kWh/m²	29 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	45 kWh/m²	45 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.5500 (2b)	=	170.7480 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7800 (17)
Infiltration rate		0.1390 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1181 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1506	0.1477	0.1447	0.1300	0.1270	0.1122	0.1122	0.1093	0.1181	0.1270	0.1329	0.1388	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2866	0.2837	0.2807	0.2660	0.2630	0.2482	0.2482	0.2453	0.2541	0.2630	0.2689	0.2748 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.5900	1.2357	16.7937			(27)
Exposed Floor			15.1200	0.1275	1.9279	110.0000	1663.2000	(28b)
Brickwork	63.5900	23.8200	39.7700	0.2100	8.3517	110.0000	4374.7000	(29a)
Communal Wall	15.0100		15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Total net area of external elements Aum(A, m2)			93.7200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.2025			(33)
Main dwelling								
Party Wall 1			30.0000	0.0000	0.0000	110.0000	3300.0000	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			66.9600			30.0000	2008.8000	(32b)
Internal Wall 1			124.7200			9.0000	1122.4800	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16237.0801 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.4893 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	44.6800	0.0380	1.6978
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	8.7800	-0.0970	-0.8517
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.0800	0.0500	0.5040
E4 Jamb	37.6900	0.0160	0.6030
E20 Exposed floor (normal)	6.9900	0.1200	0.8388
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6700	0.3300	0.8811
P7 Party Wall - Exposed floor (normal)	4.3300	0.4800	2.0784
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7462 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.9486 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.1513	15.9849	15.8185	14.9863	14.8199	13.9877	13.9877	13.8212	14.3205	14.8199	15.1527	15.4856	(38)
Heat transfer coeff	65.1000	64.9335	64.7671	63.9349	63.7685	62.9363	62.9363	62.7699	63.2692	63.7685	64.1013	64.4342	(39)
Average = Sum(39)m / 12 =												63.8933	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9722	0.9697	0.9673	0.9548	0.9523	0.9399	0.9399	0.9374	0.9449	0.9523	0.9573	0.9623	(40)
HLP (average)												0.9542	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)
Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
									Total per year (kWh/year) = Sum(64)m =		2232.7623	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)

Water heating gains (Table 5)

	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)

Total internal gains

	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	10.6334	0.3300	0.0000	0.7700	22.0749	(74)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)
South	2.1800	46.7521	0.3100	0.0000	0.7700	24.3282	(78)

Solar gains	99.8946	186.6704	294.7666	423.8373	522.9002	538.8835	511.4209	435.4348	339.6314	217.3572	122.7671	83.4134	(83)
Total gains	587.0314	672.0007	764.6299	864.4598	934.6665	924.3873	881.2764	807.9361	726.8816	631.0874	568.6530	557.4318	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.2827	69.4603	69.6388	70.5452	70.7293	71.6645	71.6645	71.8545	71.2875	70.7293	70.3620	69.9985	
alpha	5.6188	5.6307	5.6426	5.7030	5.7153	5.7776	5.7776	5.7903	5.7525	5.7153	5.6908	5.6666	
util living area	0.9853	0.9687	0.9218	0.7998	0.6164	0.4337	0.3140	0.3568	0.5874	0.8714	0.9704	0.9886	(86)
MIT	20.1371	20.3306	20.6022	20.8601	20.9712	20.9968	20.9996	20.9992	20.9836	20.8071	20.4231	20.0969	(87)
Th 2	20.1065	20.1086	20.1107	20.1212	20.1232	20.1337	20.1337	20.1358	20.1295	20.1232	20.1191	20.1149	(88)
util rest of house	0.9812	0.9603	0.9028	0.7616	0.5641	0.3759	0.2523	0.2901	0.5186	0.8342	0.9611	0.9853	(89)
MIT 2	19.1206	19.3635	19.6941	19.9922	20.1017	20.1320	20.1336	20.1355	20.1197	19.9467	19.4904	19.0764	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.5955	19.8153	20.1183	20.3976	20.5079	20.5360	20.5381	20.5390	20.5233	20.3486	19.9261	19.5531	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5955	19.8153	20.1183	20.3976	20.5079	20.5360	20.5381	20.5390	20.5233	20.3486	19.9261	19.5531	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9783	0.9571	0.9030	0.7742	0.5874	0.4029	0.2811	0.3213	0.5502	0.8446	0.9587	0.9827	(94)
Useful gains	574.2713	643.1715	690.4443	669.2341	549.0505	372.4005	247.7348	259.5557	399.9483	533.0183	545.1445	547.7909	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	995.7335	968.5007	882.0201	735.0981	561.6651	373.5895	247.8517	259.8030	406.3952	621.6556	822.1713	989.2678	(97)
Space heating kWh	313.5679	218.6213	142.5324	47.4221	9.3853	0.0000	0.0000	0.0000	0.0000	65.9461	199.4593	328.4588	(98a)
Space heating requirement - total per year (kWh/year)												1325.3932	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	313.5679	218.6213	142.5324	47.4221	9.3853	0.0000	0.0000	0.0000	0.0000	65.9461	199.4593	328.4588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1325.3932	
Space heating per m2											(98c) / (4) =	19.7938	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	313.5679	218.6213	142.5324	47.4221	9.3853	0.0000	0.0000	0.0000	0.0000	65.9461	199.4593	328.4588	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	313.5679	218.6213	142.5324	47.4221	9.3853	0.0000	0.0000	0.0000	0.0000	65.9461	199.4593	328.4588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating

Water heating requirement

	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.3942	9.3883	10.3942	10.0589	10.3942	10.0589	10.3942	10.3942	10.0589	10.3942	10.0589	10.3942	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1325.3932	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	122.3836	(230a)
Total electricity for the above, kWh/year	122.3836	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2222.6351	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1325.3932	16.4900	218.5573	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	16.4900	101.8021	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	122.3836	16.4900	20.1811	(249)
Energy for lighting	157.5018	16.4900	25.9720	(250)
Additional standing charges			0.0000	(251)
Total energy cost			366.5125	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1785	(257)
SAP value		80.8966	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1325.3932	0.1573	208.5445	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			295.6753	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			335.3838	(272)
CO2 emissions per m2			5.0100	(273)
EI value			95.9859	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.5500	(2b) =	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		170.7480	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7800	(17)
Infiltration rate		0.1390	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1181	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1270	0.1211	0.1211	0.1122	0.1152	0.1004	0.1004	0.0975	0.1004	0.1122	0.1093	0.1181	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2630	0.2571	0.2571	0.2482	0.2512	0.2364	0.2364	0.2335	0.2364	0.2482	0.2453	0.2541	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.5900	1.2357	16.7937			(27)
Exposed Floor			15.1200	0.1275	1.9279	110.0000	1663.2000	(28b)
Brickwork	63.5900	23.8200	39.7700	0.2100	8.3517	110.0000	4374.7000	(29a)
Communal Wall	15.0100		15.0100	0.2200	3.3022	110.0000	1651.1000	(29a)
Total net area of external elements Aum(A, m2)			93.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2025			(33)
Main dwelling								
Party Wall 1			30.0000	0.0000	0.0000	110.0000	3300.0000	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			66.9600			30.0000	2008.8000	(32b)
Internal Wall 1			124.7200			9.0000	1122.4800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16237.0801	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.4893	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	44.6800	0.0380	1.6978
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	8.7800	-0.0970	-0.8517
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.0800	0.0500	0.5040
E4 Jamb	37.6900	0.0160	0.6030
E20 Exposed floor (normal)	6.9900	0.1200	0.8388
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6700	0.3300	0.8811
P7 Party Wall - Exposed floor (normal)	4.3300	0.4800	2.0784
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.7462	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	48.9486	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.8199	14.4870	14.4870	13.9877	14.1541	13.3219	13.3219	13.1555	13.3219	13.9877	13.8212	14.3205	(38)
Heat transfer coeff	63.7685	63.4356	63.4356	62.9363	63.1027	62.2706	62.2706	62.1041	62.2706	62.9363	62.7699	63.2692	(39)
Average = Sum(39)m / 12 =												62.8808	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9523	0.9474	0.9474	0.9399	0.9424	0.9300	0.9300	0.9275	0.9300	0.9399	0.9374	0.9449	(40)
HLP (average)												0.9391	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1701	(42)
Hot water usage for mixer showers		

	60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)
Hot water usage for baths													
	26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)
Hot water usage for other uses													
	36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)
Average daily hot water use (litres/day)												113.6581	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m													
	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
										Total per year (kWh/year) = Sum(64)m =		2232.7623	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains													
	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	12.7650	0.3300	0.0000	0.7700	26.5002	(74)
East	11.4100	23.8018	0.3100	0.0000	0.7700	64.8257	(76)
South	2.1800	54.2217	0.3100	0.0000	0.7700	28.2151	(78)

Solar gains	119.5410	195.6950	307.7746	450.3523	541.7219	590.5450	554.9361	484.2805	378.4539	244.8816	144.8304	100.3235	(83)
Total gains	606.6777	681.0253	777.6378	890.9748	953.4882	976.0489	924.7916	856.7819	765.7040	658.6119	590.7163	574.3419	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.7293	71.1004	71.1004	71.6645	71.4755	72.4307	72.4307	72.6248	72.4307	71.6645	71.8545	71.2875	
alpha	5.7153	5.7400	5.7400	5.7776	5.7650	5.8287	5.8287	5.8417	5.8287	5.7776	5.7903	5.7525	
util living area													
	0.9780	0.9570	0.8920	0.7327	0.5291	0.3314	0.2222	0.2464	0.4841	0.8083	0.9521	0.9825	(86)
MIT	20.2839	20.4566	20.7119	20.9218	20.9887	20.9994	21.0000	20.9999	20.9950	20.8881	20.5670	20.2469	(87)
Th 2	20.1232	20.1274	20.1274	20.1337	20.1316	20.1421	20.1421	20.1442	20.1421	20.1337	20.1358	20.1295	(88)
util rest of house													
	0.9717	0.9457	0.8671	0.6883	0.4750	0.2769	0.1644	0.1844	0.4167	0.7598	0.9374	0.9775	(89)
MIT 2	19.3182	19.5344	19.8364	20.0663	20.1241	20.1419	20.1421	20.1442	20.1396	20.0396	19.6799	19.2773	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	19.7693	19.9652	20.2454	20.4659	20.5280	20.5425	20.5428	20.5439	20.5392	20.4360	20.0943	19.7302	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7693	19.9652	20.2454	20.4659	20.5280	20.5425	20.5428	20.5439	20.5392	20.4360	20.0943	19.7302	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9687	0.9432	0.8708	0.7059	0.4999	0.3024	0.1914	0.2134	0.4481	0.7777	0.9365	0.9746	(94)
Useful gains	587.6931	642.3738	677.1557	628.8996	476.6700	295.1216	177.0160	182.8136	343.1030	512.1930	553.2285	559.7629	(95)

Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	935.4388	904.9223	814.8559	664.9814	481.3486	295.3155	177.0253	182.8309	344.9266	562.3982	759.1599	925.6433	(97)
Space heating kWh	258.7228	176.4326	102.4489	25.9788	3.4809	0.0000	0.0000	0.0000	0.0000	37.3527	148.2707	272.2150	(98a)
Space heating requirement - total per year (kWh/year)												1024.9024	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	258.7228	176.4326	102.4489	25.9788	3.4809	0.0000	0.0000	0.0000	0.0000	37.3527	148.2707	272.2150	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1024.9024	
Space heating per m2											(98c) / (4) =	15.3062	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	258.7228	176.4326	102.4489	25.9788	3.4809	0.0000	0.0000	0.0000	0.0000	37.3527	148.2707	272.2150	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	258.7228	176.4326	102.4489	25.9788	3.4809	0.0000	0.0000	0.0000	0.0000	37.3527	148.2707	272.2150	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.3942	9.3883	10.3942	10.0589	10.3942	10.0589	10.3942	10.3942	10.0589	10.3942	10.0589	10.3942	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1024.9024	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												617.3565	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												122.3836	(230a)
Total electricity for the above, kWh/year												122.3836	(231)
Electricity for lighting (calculated in Appendix L)												157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1922.1443	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1024.9024	27.6700	283.5905	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	27.6700	170.8225	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	122.3836	27.6700	33.8635	(249)
Energy for lighting	157.5018	27.6700	43.5808	(250)
Additional standing charges			0.0000	(251)
Total energy cost			531.8573	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1024.9024	0.1582	162.0900	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			249.2209	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			288.9294	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1024.9024	1.5854	1624.9116	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	1.5219	939.5420	(278)
Space and water heating			2564.4536	(279)
Pumps, fans and electric keep-hot	122.3836	1.5128	185.1419	(281)
Energy for lighting	157.5018	1.5338	241.5815	(282)
Total Primary energy kWh/year			2991.1771	(286)

Summary for Input Data

Plot Reference	P-10	**Issued on Date**	24/04/2026
Assessment Reference	P-10-1C	**Plot Type Ref**	P-10
Plot Address	P-10, Carter's Site, Reading	**SAP Version**	10.2

SAP Rating	86 B	**DER**	4.30	**TER**	13.32
Environmental	97 A	**% DER < TER**			67.72
CO_2 Emissions (t/year)	0.18	**DFEE**	30.84	**TFEE**	29.10
Compliance Check	See BREL	**% DFEE < TFEE**			-6.01
% DPER < TPER	36.91	**DPER**	44.71	**TPER**	70.87

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	272.79	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	18.48 m	51.78 m²	2.55 m

8.0 Living Area	23.96	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	31.41	19.48	0.00	None	11.93	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	18.11	16.05	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Smoke Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	3.93	3.93	0.90	Stairwell Access Corridor 4	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	35.29	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	80.40

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	51.78

11.1 Party Floors

Summary for Input Data

elmhurst energy

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	51.78

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	South	2.06	
Patio Door	Window-Red	Brickwork	East	6.50	
Side	Window-Red	Brickwork	East	5.42	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	34.30	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	5.76	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.88	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	5.76	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	24.12	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	5.99	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	13.69	0.02	0.02	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	2.66	0.33	0.33	Abbey Calculated	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	5.76	0.03	0.03	RCD	No

Y-value	0.06	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0

Summary for Input Data

Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	6
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	Yes

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

Summary for Input Data

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-10	**Issued on Date**	24/04/2026
Assessment Reference	P-10-1C	**Plot Type Ref**	P-10
Plot Address	P-10, Carter's Site, Reading	**SAP Version**	10.2

SAP Rating	86 B	**DER**	4.30	**TER**	13.32
Environmental	97 A	**% DER < TER**			67.72
CO_2 Emissions (t/year)	0.18	**DFEE**	30.84	**TFEE**	29.10
Compliance Check	See BREL	**% DFEE < TFEE**			-6.01
% DPER < TPER	36.91	**DPER**	44.71	**TPER**	70.87

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

			Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling								
Ground floor			51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)		51.7800						(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0390	(5)

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2. Ventilation rate

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		m3 per hour		
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2000	0.7860	110.0000	432.3000	(29a)
Total net area of external elements Aum(A, m2)			53.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.6119			(33)
Main dwelling								
Party Wall 1			35.2900	0.0000	0.0000	110.0000	3881.9001	(32)
Party Floor 1			51.7800			70.0000	3624.6000	(32d)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			80.4000			9.0000	723.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14125.2002	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	272.7926	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	34.3000	0.0380	1.3034
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6600	0.3300	0.8778
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.1289 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.7408 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0092	12.8703	12.7314	12.0370	11.8981	11.2037	11.2037	11.0648	11.4815	11.8981	12.1759	12.4537	(38)
Heat transfer coeff	41.7500	41.6111	41.4722	40.7778	40.6389	39.9445	39.9445	39.8056	40.2222	40.6389	40.9167	41.1945	(39)

Average = Sum(39)m / 12 = 40.7431

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8063	0.8036	0.8009	0.7875	0.7848	0.7714	0.7714	0.7687	0.7768	0.7848	0.7902	0.7956	(40)
HLP (average)												0.7868	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)
Hot water usage for baths	23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)
Hot water usage for other uses	32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):

Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
									Total per year (kWh/year) = Sum(64)m =			2009.3981	(64)
12Total per year (kWh/year)												2009	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5935	84.8000	76.5935	79.1466	76.5935	79.1466	76.5935	76.5935	79.1466	76.5935	79.1466	76.5935	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857	(72)
Total internal gains	354.7479	362.5398	346.5278	332.2219	313.8493	300.9917	288.4327	289.5875	299.3130	311.1847	332.4664	346.9729	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	19.6403	0.3100	0.0000	0.7700	55.8825	(76)

Solar gains	55.8825	109.3181	180.0313	262.5649	321.7831	329.4023	313.6044	269.3838	209.3838	129.7151	69.6789	45.9551	(83)

Total gains	410.6304	471.8579	526.5590	594.7868	635.6325	630.3940	602.0371	558.9691	508.6968	440.8998	402.1454	392.9280	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	93.9800	94.2937	94.6095	96.2207	96.5495	98.2280	98.2280	98.5708	97.5497	96.5495	95.8940	95.2474	
alpha	7.2653	7.2862	7.3073	7.4147	7.4366	7.5485	7.5485	7.5714	7.5033	7.4366	7.3929	7.3498	
util living area													
	0.9911	0.9757	0.9295	0.7849	0.5895	0.4053	0.2919	0.3275	0.5429	0.8620	0.9761	0.9932	(86)
MIT	20.4048	20.5700	20.7702	20.9454	20.9933	20.9997	21.0000	20.9999	20.9972	20.9123	20.6376	20.3798	(87)
Th 2	20.2479	20.2502	20.2525	20.2642	20.2665	20.2782	20.2782	20.2805	20.2735	20.2665	20.2618	20.2572	(88)
util rest of house													
	0.9883	0.9687	0.9117	0.7483	0.5449	0.3597	0.2440	0.2763	0.4870	0.8248	0.9680	0.9911	(89)
MIT 2	19.5637	19.7719	20.0147	20.2158	20.2617	20.2780	20.2782	20.2805	20.2719	20.1894	19.8679	19.5399	(90)
Living area fraction										fLA = Living area / (4) =		0.4627	(91)
MIT	19.9529	20.1412	20.3643	20.5534	20.6003	20.6119	20.6122	20.6134	20.6076	20.5239	20.2241	19.9285	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9529	20.1412	20.3643	20.5534	20.6003	20.6119	20.6122	20.6134	20.6076	20.5239	20.2241	19.9285	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9675	0.9146	0.7631	0.5653	0.3808	0.2662	0.3000	0.5128	0.8387	0.9675	0.9899	(94)
Useful gains	405.2986	456.5285	481.5912	453.8886	359.3221	240.0412	160.2583	167.7039	260.8767	369.7658	389.0848	388.9509	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	653.5086	634.2048	574.9843	475.1989	361.6967	240.1432	160.2637	167.7168	261.7483	403.2982	536.9929	647.9288	(97)
Space heating kWh													
	184.6682	119.3984	69.4844	15.3434	1.7667	0.0000	0.0000	0.0000	0.0000	24.9481	106.4938	192.6795	(98a)
Space heating requirement - total per year (kWh/year)												714.7827	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	184.6682	119.3984	69.4844	15.3434	1.7667	0.0000	0.0000	0.0000	0.0000	24.9481	106.4938	192.6795	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												714.7827	
Space heating per m2											(98c) / (4) =	13.8042	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	184.6682	119.3984	69.4844	15.3434	1.7667	0.0000	0.0000	0.0000	0.0000	24.9481	106.4938	192.6795	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	184.6682	119.3984	69.4844	15.3434	1.7667	0.0000	0.0000	0.0000	0.0000	24.9481	106.4938	192.6795	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378	(231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												714.7827	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.5965	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.6389	(230a)
Total electricity for the above, kWh/year	94.6389	(231)
Electricity for lighting (calculated in Appendix L)	125.8149	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1490.8330	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	714.7827	0.1583	113.1434	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			191.5304	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			222.8169	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	714.7827	1.5859	1133.5916	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	1.5217	845.4483	(278)
Space and water heating			1979.0399	(279)
Pumps, fans and electric keep-hot	94.6389	1.5128	143.1698	(281)
Energy for lighting	125.8149	1.5338	192.9790	(282)
Total Primary energy kWh/year			2315.1887	(286)
Dwelling Primary energy Rate (DPER)			44.7100	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b) x	2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.0390	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1515	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4015	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3412	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4351	0.4266	0.4180	0.3754	0.3668	0.3242	0.3242	0.3157	0.3412	0.3668	0.3839	0.4010	(22b)
Effective ac	0.5947	0.5910	0.5874	0.5705	0.5673	0.5525	0.5525	0.5498	0.5582	0.5673	0.5737	0.5804	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8900	1.1450	12.4695			(27)
Brickwork	31.4100	10.8900	20.5200	0.1800	3.6936			(29a)
Communal Wall	18.1100	2.0600	16.0500	0.1800	2.8890			(29a)
Smoke Shaft Wall	3.9300		3.9300	0.1800	0.7074			(29a)
Total net area of external elements Aum(A, m2)			53.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.8195			(33)
Main dwelling								
Party Wall 1			35.2900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 272.7926 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	34.3000	0.0700	2.4010
E16 Corner (normal)	5.7600	0.0900	0.5184
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0900	-0.2592
E18 Party wall between dwellings	5.7600	0.0600	0.3456
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.6900	0.0500	0.6845
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6600	0.0200	0.0532
E25 Staggered party wall between dwellings	5.7600	0.0600	0.3456

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.3886 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 26.2081 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9107	25.7506	25.5936	24.8563	24.7183	24.0761	24.0761	23.9572	24.3235	24.7183	24.9974	25.2892	(38)
Heat transfer coeff	52.1188	51.9587	51.8017	51.0643	50.9264	50.2842	50.2842	50.1653	50.5316	50.9264	51.2055	51.4972	(39)

Average = Sum(39)m / 12 = 51.0637

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0065	1.0035	1.0004	0.9862	0.9835	0.9711	0.9711	0.9688	0.9759	0.9835	0.9889	0.9945	(40)
HLP (average)												0.9862	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

Hot water usage for mixer showers

53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

219.2487	194.0085	206.2147	181.3616	175.8871	158.5604	156.4492	162.5591	164.2478	183.0838	194.6256	216.8439	(62)
WWHRS -24.4291	-21.6053	-22.6238	-18.7334	-17.4589	-14.9397	-14.0036	-14.8914	-15.4572	-18.2223	-20.6436	-23.9767	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
194.8196	172.4032	183.5909	162.6281	158.4283	143.6208	142.4457	147.6678	148.7906	164.8615	173.9820	192.8672	(64)
									Total per year (kWh/year) = Sum(64)m =		1986.1055	(64)
12Total per year (kWh/year)											1986	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

94.6833	84.1829	90.3495	81.3832	80.2656	73.8018	73.8025	75.8340	75.6928	82.6585	85.7935	93.8837	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7956	85.0237	76.7956	79.3555	76.7956	79.3555	76.7956	76.7956	79.3555	76.7956	79.3555	76.7956	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)	127.2625	125.2722	121.4375	113.0322	107.8838	102.5025	99.1969	101.9275	105.1289	111.1001	119.1576	126.1878	(72)

Total internal gains	408.0521	415.8656	399.8319	385.5328	367.1535	351.3026	338.7369	339.8917	349.6239	364.4889	385.7774	400.2771 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.8900	19.6403	0.6300	0.7000	0.7700	65.3653	(76)

Solar gains	65.3653	127.8683	210.5809	307.1197	376.3867	385.2988	366.8202	315.0931	244.9143	151.7265	81.5028	53.7532 (83)
Total gains	473.4174	543.7339	610.4128	692.6525	743.5402	736.6014	705.5571	654.9848	594.5382	516.2154	467.2802	454.0303 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2831	75.5152	75.7440	76.8377	77.0458	78.0298	78.0298	78.2148	77.6478	77.0458	76.6259	76.1918	
alpha	6.0189	6.0343	6.0496	6.1225	6.1364	6.2020	6.2020	6.2143	6.1765	6.1364	6.1084	6.0795	
util living area	0.9882	0.9727	0.9305	0.8061	0.6218	0.4354	0.3134	0.3520	0.5773	0.8707	0.9723	0.9905	(86)
MIT	20.2032	20.3907	20.6371	20.8818	20.9776	20.9979	20.9998	20.9995	20.9891	20.8406	20.4890	20.1760	(87)
Th 2	20.0779	20.0805	20.0830	20.0949	20.0971	20.1075	20.1075	20.1094	20.1035	20.0971	20.0926	20.0879	(88)
util rest of house	0.9844	0.9645	0.9114	0.7656	0.5668	0.3754	0.2499	0.2840	0.5063	0.8304	0.9626	0.9874	(89)
MIT 2	19.1730	19.4088	19.7085	19.9894	20.0812	20.1065	20.1074	20.1093	20.0975	19.9568	19.5436	19.1465	(90)
Living area fraction									fLA = Living area / (4) =			0.4627	(91)
MIT	19.6497	19.8631	20.1382	20.4023	20.4960	20.5189	20.5203	20.5212	20.5101	20.3658	19.9810	19.6229	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6497	19.8631	20.1382	20.4023	20.4960	20.5189	20.5203	20.5212	20.5101	20.3658	19.9810	19.6229	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9822	0.9622	0.9127	0.7800	0.5915	0.4032	0.2793	0.3155	0.5389	0.8434	0.9611	0.9854	(94)
Useful gains	464.9874	523.1783	557.1042	540.2766	439.7845	296.9852	197.0785	206.6329	320.4026	435.3535	449.1202	447.4118	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	800.0066	777.4645	706.4805	587.3595	447.9501	297.6289	197.1308	206.7422	323.9111	497.3367	659.5789	794.2353	(97)
Space heating kWh	249.2543	170.8803	111.1359	33.8997	6.0752	0.0000	0.0000	0.0000	0.0000	46.1155	151.5303	258.0367	(98a)
Space heating requirement - total per year (kWh/year)												1026.9278	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.2543	170.8803	111.1359	33.8997	6.0752	0.0000	0.0000	0.0000	0.0000	46.1155	151.5303	258.0367	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1026.9278	
Space heating per m2										(98c) / (4) =		19.8325	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	249.2543	170.8803	111.1359	33.8997	6.0752	0.0000	0.0000	0.0000	0.0000	46.1155	151.5303	258.0367	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	270.0480	185.1357	120.4073	36.7277	6.5820	0.0000	0.0000	0.0000	0.0000	49.9626	164.1715	279.5630	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	194.8196	172.4032	183.5909	162.6281	158.4283	143.6208	142.4457	147.6678	148.7906	164.8615	173.9820	192.8672	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6134	84.0399	82.9710	81.2199	80.0998	79.8000	79.8000	79.8000	79.8000	81.6079	83.7514	84.7134	(217)
Fuel for water heating, kWh/month	230.2466	205.1445	221.2712	200.2318	197.7886	179.9759	178.5034	185.0473	186.4544	202.0167	207.7361	227.6703	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9566	12.8010	11.5259	8.4443	6.5227	5.3291	5.9502	7.7343	10.0461	13.1810	14.8879	16.4001	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0107	-20.8327	-31.5710	-37.5014	-42.2255	-40.0921	-39.6239	-36.5254	-31.3627	-24.7092	-15.7887	-11.9918	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9433	-10.6372	-21.5862	-33.0751	-44.3680	-44.7925	-44.2453	-37.1547	-26.8455	-15.4032	-6.6625	-3.8902	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1112.5978	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2422.0868	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.7790	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-639.8390	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3109.6246	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1112.5978	0.2100	233.6455	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2422.0868	0.2100	508.6382	(264)
Space and water heating			742.2838	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.7790	0.1443	18.5868	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.2352	0.1335	-46.2094	
PV Unit electricity exported	-293.6039	0.1253	-36.7965	
Total			-83.0059	(269)
Total CO2, kg/year			689.7939	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1112.5978	1.1300	1257.2355	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2422.0868	1.1300	2736.9581	(278)
Space and water heating			3994.1936	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.7790	1.5338	197.5256	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.2352	1.4932	-516.9951	
PV Unit electricity exported	-293.6039	0.4600	-135.0606	
Total			-652.0558	(283)
Total Primary energy kWh/year			3669.7642	(286)
Target Primary Energy Rate (TPER)			70.8700	(287)

Full SAP Calculation Printout

Plot Reference	P-10	**Issued on Date**	24/04/2026
Assessment Reference	P-10-1C	**Plot Type Ref**	P-10
Plot Address	P-10, Carter's Site, Reading	**SAP Version**	10.2

SAP Rating	86 B	**DER**	4.30	**TER**	13.32
Environmental	97 A	**% DER < TER**			67.72
CO_2 Emissions (t/year)	0.18	**DFEE**	30.84	**TFEE**	29.10
Compliance Check	See BREL	**% DFEE < TFEE**			-6.01
% DPER < TPER	36.91	**DPER**	44.71	**TPER**	70.87

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	132.0390	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1515	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3015	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2562	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3267	0.3203	0.3139	0.2819	0.2755	0.2434	0.2434	0.2370	0.2562	0.2755	0.2883	0.3011	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5534	0.5513	0.5493	0.5397	0.5379	0.5296	0.5296	0.5281	0.5328	0.5379	0.5416	0.5453	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2000	0.7860	110.0000	432.3000	(29a)
Total net area of external elements Aum(A, m2)			53.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.6119			(33)
Main dwelling								
Party Wall 1			35.2900	0.0000	0.0000	110.0000	3881.9001	(32)
Party Floor 1			51.7800			70.0000	3624.6000	(32d)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			80.4000			9.0000	723.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14125.2002 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		272.7926 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	34.3000	0.0380	1.3034

E16 Corner (normal)	5.7600	0.0540	0.3110	
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794	
E18 Party wall between dwellings	5.7600	0.0380	0.2189	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1200	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995	
E4 Jamb	13.6900	0.0160	0.2190	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6600	0.3300	0.8778	
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.1289 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.7408 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.1120	24.0217	23.9332	23.5174	23.4397	23.0775	23.0775	23.0105	23.2170	23.4397	23.5970	23.7615	(38)

Heat transfer coeff

	52.8528	52.7625	52.6740	52.2582	52.1805	51.8183	51.8183	51.7513	51.9578	52.1805	52.3378	52.5023	(39)

Average = Sum(39)m / 12 = 52.2579

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0207	1.0190	1.0173	1.0092	1.0077	1.0007	1.0007	0.9994	1.0034	1.0077	1.0108	1.0140	(40)
HLP (average)												1.0092	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 50.9434 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	55.5786	54.0545	52.3904	50.3186	48.4706	46.5500	46.1504	47.8112	49.5145	51.4869	53.5771	55.5005	(44)
Energy conte	88.0229	76.9729	80.5221	68.8837	65.2507	57.2386	55.8150	59.2002	61.0563	69.8673	76.3304	86.9003	(45)

Energy content (annual) Total = Sum(45)m = 846.0606

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.8195	65.4270	68.4438	58.5511	55.4631	48.6528	47.4427	50.3202	51.8979	59.3872	64.8808	73.8653	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

74.8195	65.4270	68.4438	58.5511	55.4631	48.6528	47.4427	50.3202	51.8979	59.3872	64.8808	73.8653	(64)

Total per year (kWh/year) = Sum(64)m = 719.1515 (64)

12Total per year (kWh/year) 719 (64)

Electric shower(s)

42.7940	38.1298	41.6363	39.7330	40.4786	38.6126	39.8997	40.4786	39.7330	41.6363	40.8534	42.7940	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 486.7793 (64a)

Heat gains from water heating, kWh/month

29.4034	25.8892	27.5200	24.5710	23.9854	21.8164	21.8356	22.6997	22.9077	25.2559	26.4336	29.1648	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

76.5935	84.8000	76.5935	79.1466	76.5935	79.1466	76.5935	76.5935	79.1466	76.5935	79.1466	76.5935	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)

Water heating gains (Table 5)

39.5207	38.5256	36.9893	34.1264	32.2385	30.3005	29.3489	30.5103	31.8163	33.9461	36.7133	39.2000	(72)

Total internal gains

317.1081	325.8953	312.1816	303.4183	288.3060	278.8918	268.6868	268.2724	276.1024	284.1327	300.1242	310.0872	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	19.6403	0.3100	0.0000	0.7700	55.8825	(76)

Solar gains	55.8825	109.3181	180.0313	262.5649	321.7831	329.4023	313.6044	269.3816	209.3838	129.7151	69.6789	45.9551	(83)
Total gains	372.9906	435.2134	492.2129	565.9831	610.0891	608.2941	582.2912	537.6540	485.4862	413.8478	369.8031	356.0423	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.2376	74.3647	74.4896	75.0823	75.1942	75.7197	75.7197	75.8178	75.5164	75.1942	74.9681	74.7332	
alpha	5.9492	5.9576	5.9660	6.0055	6.0129	6.0480	6.0480	6.0545	6.0344	6.0129	5.9979	5.9822	
util living area	0.9966	0.9908	0.9729	0.9001	0.7440	0.5388	0.3907	0.4410	0.7033	0.9453	0.9914	0.9974	(86)
MIT	19.9912	20.1739	20.4371	20.7569	20.9379	20.9923	20.9991	20.9981	20.9662	20.7003	20.2863	19.9584	(87)
Th 2	20.0661	20.0676	20.0690	20.0756	20.0769	20.0827	20.0827	20.0838	20.0805	20.0769	20.0744	20.0717	(88)
util rest of house	0.9954	0.9877	0.9637	0.8703	0.6862	0.4645	0.3097	0.3541	0.6237	0.9216	0.9879	0.9965	(89)
MIT 2	19.1539	19.3360	19.5940	19.8948	20.0403	20.0797	20.0825	20.0833	20.0648	19.8531	19.4539	19.1258	(90)
Living area fraction											fLA = Living area / (4) =	0.4627	(91)
MIT	19.5413	19.7237	19.9841	20.2937	20.4557	20.5020	20.5066	20.5066	20.4819	20.2451	19.8391	19.5111	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5413	19.7237	19.9841	20.2937	20.4557	20.5020	20.5066	20.5066	20.4819	20.2451	19.8391	19.5111	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9863	0.9627	0.8780	0.7108	0.4988	0.3473	0.3944	0.6597	0.9266	0.9868	0.9957	(94)
Useful gains	370.9283	429.2379	473.8370	496.9559	433.6597	303.4351	202.2127	212.0563	320.2842	383.4661	364.9233	354.5179	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	805.5468	782.1372	710.2641	595.4159	456.8749	305.8303	202.4345	212.5229	331.5895	503.2849	666.7345	803.8664	(97)
Space heating kWh	323.3562	237.1483	175.9017	70.8912	17.2721	0.0000	0.0000	0.0000	0.0000	89.1452	217.3041	334.3153	(98a)
Space heating requirement - total per year (kWh/year)												1465.3342	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	323.3562	237.1483	175.9017	70.8912	17.2721	0.0000	0.0000	0.0000	0.0000	89.1452	217.3041	334.3153	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1465.3342	
Space heating per m2											(98c) / (4) =	28.2992	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	487.0923	383.4557	393.3097	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9593	0.9833	0.9727	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	467.2452	377.0600	382.5742	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	683.6285	654.7512	604.0429	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	155.7960	206.6023	164.7727	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.9490	51.6506	41.1932	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												131.7928	(107)
Energy for space heating												28.2992	(99)
Energy for space cooling												2.5452	(108)
Total												30.8445	(109)
Fabric Energy Efficiency (DFEE)												30.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.0390	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1515	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.4015	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3412	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4351	0.4266	0.4180	0.3754	0.3668	0.3242	0.3242	0.3157	0.3412	0.3668	0.3839	0.4010	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5947	0.5910	0.5874	0.5705	0.5673	0.5525	0.5525	0.5498	0.5582	0.5673	0.5737	0.5804	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8900	1.1450	12.4695			(27)
Brickwork	31.4100	10.8900	20.5200	0.1800	3.6936			(29a)
Communal Wall	18.1100	2.0600	16.0500	0.1800	2.8890			(29a)
Smoke Shaft Wall	3.9300		3.9300	0.1800	0.7074			(29a)
Total net area of external elements Aum(A, m2)			53.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.8195			(33)
Main dwelling								
Party Wall 1			35.2900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	272.7926	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	34.3000	0.0700	2.4010
E16 Corner (normal)	5.7600	0.0900	0.5184
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0900	-0.2592
E18 Party wall between dwellings	5.7600	0.0600	0.3456
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.6900	0.0500	0.6845
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6600	0.0200	0.0532
E25 Staggered party wall between dwellings	5.7600	0.0600	0.3456

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.3886	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	26.2081	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9107	25.7506	25.5936	24.8563	24.7183	24.0761	24.0761	23.9572	24.3235	24.7183	24.9974	25.2892	(38)
Heat transfer coeff	52.1188	51.9587	51.8017	51.0643	50.9264	50.2842	50.2842	50.1653	50.5316	50.9264	51.2055	51.4972	(39)

Average = Sum(39)m / 12 =	51.0637	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0065	1.0035	1.0004	0.9862	0.9835	0.9711	0.9711	0.9688	0.9759	0.9835	0.9889	0.9945	(40)
HLP (average)												0.9862	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7426	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

	32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day)	50.9434	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5786	54.0545	52.3904	50.3186	48.4706	46.5500	46.1504	47.8112	49.5145	51.4869	53.5771	55.5005	(44)
Energy conte	88.0229	76.9729	80.5221	68.8837	65.2507	57.2386	55.8150	59.2002	61.0563	69.8673	76.3304	86.9003	(45)

Energy content (annual) Total = Sum(45)m =	846.0606	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	74.8195	65.4270	68.4438	58.5511	55.4631	48.6528	47.4427	50.3202	51.8979	59.3872	64.8808	73.8653	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	74.8195	65.4270	68.4438	58.5511	55.4631	48.6528	47.4427	50.3202	51.8979	59.3872	64.8808	73.8653	(64)

Total per year (kWh/year) = Sum(64)m =	719.1515	(64)
12Total per year (kWh/year)	719	(64)

Electric shower(s)

	42.7940	38.1298	41.6363	39.7330	40.4786	38.6126	39.8997	40.4786	39.7330	41.6363	40.8534	42.7940	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	486.7793	(64a)

Heat gains from water heating, kWh/month

	29.4034	25.8892	27.5200	24.5710	23.9854	21.8164	21.8356	22.6997	22.9077	25.2559	26.4336	29.1648	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	76.7956	85.0237	76.7956	79.3555	76.7956	79.3555	76.7956	76.7956	79.3555	76.7956	79.3555	76.7956	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)

Water heating gains (Table 5)

	39.5207	38.5256	36.9893	34.1264	32.2385	30.3005	29.3489	30.5103	31.8163	33.9461	36.7133	39.2000	(72)

Total internal gains

	317.3102	326.1191	312.3837	303.6271	288.5081	279.1006	268.8889	268.4745	276.3113	284.3348	300.3330	310.2894	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.8900	19.6403	0.6300	0.7000	0.7700	65.3653	(76)

Solar gains	65.3653	127.8683	210.5809	307.1197	376.3867	385.2988	366.8202	315.0931	244.9143	151.7265	81.5028	53.7532	(83)
Total gains	382.6755	453.9874	522.9646	610.7468	664.8949	664.3994	635.7091	583.5676	521.2256	436.0613	381.8358	364.0426	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2831	75.5152	75.7440	76.8377	77.0458	78.0298	78.0298	78.2148	77.6478	77.0458	76.6259	76.1918	
alpha	6.0189	6.0343	6.0496	6.1225	6.1364	6.2020	6.2020	6.2143	6.1765	6.1364	6.1084	6.0795	
util living area	0.9960	0.9884	0.9631	0.8645	0.6843	0.4816	0.3477	0.3947	0.6494	0.9286	0.9895	0.9970	(86)
MIT	20.0316	20.2320	20.5097	20.8215	20.9629	20.9963	20.9996	20.9991	20.9797	20.7521	20.3371	20.0039	(87)
Th 2	20.0779	20.0805	20.0830	20.0949	20.0971	20.1075	20.1075	20.1094	20.1035	20.0971	20.0926	20.0879	(88)
util rest of house	0.9946	0.9845	0.9513	0.8296	0.6272	0.4158	0.2774	0.3187	0.5732	0.9003	0.9854	0.9959	(89)
MIT 2	19.2036	19.4036	19.6746	19.9658	20.0760	20.1061	20.1074	20.1092	20.0944	19.9161	19.5187	19.1842	(90)
Living area fraction									fLA = Living area / (4) =			0.4627	(91)
MIT	19.5868	19.7869	20.0610	20.3618	20.4864	20.5180	20.5202	20.5210	20.5040	20.3030	19.8974	19.5635	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5868	19.7869	20.0610	20.3618	20.4864	20.5180	20.5202	20.5210	20.5040	20.3030	19.8974	19.5635	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9937	0.9830	0.9510	0.8407	0.6524	0.4462	0.3099	0.3539	0.6080	0.9076	0.9843	0.9952	(94)
Useful gains	380.2532	446.2789	497.3472	513.4261	433.7698	296.4503	197.0303	206.5192	316.9277	395.7489	375.8243	362.2818	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	796.7281	773.5041	702.4847	585.2880	447.4595	297.5816	197.1257	206.7306	323.6059	494.1365	655.2964	791.1775	(97)
Space heating kWh	309.8573	219.8953	152.6223	51.7406	10.1851	0.0000	0.0000	0.0000	0.0000	73.2004	201.2199	319.0985	(98a)
Space heating requirement - total per year (kWh/year)												1337.8194	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	309.8573	219.8953	152.6223	51.7406	10.1851	0.0000	0.0000	0.0000	0.0000	73.2004	201.2199	319.0985	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1337.8194	
Space heating per m2										(98c) / (4) =		25.8366	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	472.6715	372.1031	381.2561	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9780	0.9917	0.9855	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	462.2552	369.0119	375.7299	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.9798	716.9706	657.4968	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	206.4417	258.8813	209.6346	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	51.6104	64.7203	52.4087	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												168.7394	(107)
Energy for space heating												25.8366	(99)
Energy for space cooling												3.2588	(108)
Total												29.0954	(109)
Fabric Energy Efficiency (TFEE)												29.1	(109)

Full SAP Calculation Printout

Plot Reference	P-10	**Issued on Date**	24/04/2026
Assessment Reference	P-10-1C	**Plot Type Ref**	P-10
Plot Address	P-10, Carter's Site, Reading	**SAP Version**	10.2

SAP Rating	86 B	**DER**	4.30	**TER**	13.32
Environmental	97 A	**% DER < TER**			67.72
CO_2 Emissions (t/year)	0.18	**DFEE**	30.84	**TFEE**	29.10
Compliance Check	See BREL	**% DFEE < TFEE**			-6.01
% DPER < TPER	36.91	**DPER**	44.71	**TPER**	70.87

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

			Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling								
Ground floor			51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)		51.7800						(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0390	(5)

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2. Ventilation rate

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		m3 per hour		
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2000	0.7860	110.0000	432.3000	(29a)
Total net area of external elements Aum(A, m2)			53.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.6119			(33)
Main dwelling								
Party Wall 1			35.2900	0.0000	0.0000	110.0000	3881.9001	(32)
Party Floor 1			51.7800			70.0000	3624.6000	(32d)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			80.4000			9.0000	723.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14125.2002	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	272.7926	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	34.3000	0.0380	1.3034
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6600	0.3300	0.8778
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.1289 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.7408 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0092	12.8703	12.7314	12.0370	11.8981	11.2037	11.2037	11.0648	11.4815	11.8981	12.1759	12.4537	(38)
Heat transfer coeff	41.7500	41.6111	41.4722	40.7778	40.6389	39.9445	39.9445	39.8056	40.2222	40.6389	40.9167	41.1945	(39)

Average = Sum(39)m / 12 = 40.7431

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8063	0.8036	0.8009	0.7875	0.7848	0.7714	0.7714	0.7687	0.7768	0.7848	0.7902	0.7956	(40)
HLP (average)												0.7868	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)
Hot water usage for baths	23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)
Hot water usage for other uses	32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):

Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
									Total per year (kWh/year) = Sum(64)m =			2009.3981	(64)
12Total per year (kWh/year)												2009	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5935	84.8000	76.5935	79.1466	76.5935	79.1466	76.5935	76.5935	79.1466	76.5935	79.1466	76.5935	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857	(72)
Total internal gains	354.7479	362.5398	346.5278	332.2219	313.8493	300.9917	288.4327	289.5875	299.3130	311.1847	332.4664	346.9729	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	19.6403	0.3100	0.0000	0.7700	55.8825	(76)

Solar gains	55.8825	109.3181	180.0313	262.5649	321.7831	329.4023	313.6044	269.3838	209.3838	129.7151	69.6789	45.9551	(83)

Total gains	410.6304	471.8579	526.5590	594.7868	635.6325	630.3940	602.0371	558.9691	508.6968	440.8998	402.1454	392.9280	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	93.9800	94.2937	94.6095	96.2207	96.5495	98.2280	98.2280	98.5708	97.5497	96.5495	95.8940	95.2474	
alpha	7.2653	7.2862	7.3073	7.4147	7.4366	7.5485	7.5485	7.5714	7.5033	7.4366	7.3929	7.3498	
util living area													
	0.9911	0.9757	0.9295	0.7849	0.5895	0.4053	0.2919	0.3275	0.5429	0.8620	0.9761	0.9932	(86)
MIT	20.4048	20.5700	20.7702	20.9454	20.9933	20.9997	21.0000	20.9999	20.9972	20.9123	20.6376	20.3798	(87)
Th 2	20.2479	20.2502	20.2525	20.2642	20.2665	20.2782	20.2782	20.2805	20.2735	20.2665	20.2618	20.2572	(88)
util rest of house													
	0.9883	0.9687	0.9117	0.7483	0.5449	0.3597	0.2440	0.2763	0.4870	0.8248	0.9680	0.9911	(89)
MIT 2	19.5637	19.7719	20.0147	20.2158	20.2617	20.2780	20.2782	20.2805	20.2719	20.1894	19.8679	19.5399	(90)
Living area fraction										fLA = Living area / (4) =		0.4627	(91)
MIT	19.9529	20.1412	20.3643	20.5534	20.6003	20.6119	20.6122	20.6134	20.6076	20.5239	20.2241	19.9285	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9529	20.1412	20.3643	20.5534	20.6003	20.6119	20.6122	20.6134	20.6076	20.5239	20.2241	19.9285	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9675	0.9146	0.7631	0.5653	0.3808	0.2662	0.3000	0.5128	0.8387	0.9675	0.9899	(94)
Useful gains	405.2986	456.5285	481.5912	453.8886	359.3221	240.0412	160.2583	167.7039	260.8767	369.7658	389.0848	388.9509	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	653.5086	634.2048	574.9843	475.1989	361.6967	240.1432	160.2637	167.7168	261.7483	403.2982	536.9929	647.9288	(97)
Space heating kWh													
	184.6682	119.3984	69.4844	15.3434	1.7667	0.0000	0.0000	0.0000	0.0000	24.9481	106.4938	192.6795	(98a)
Space heating requirement - total per year (kWh/year)												714.7827	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	184.6682	119.3984	69.4844	15.3434	1.7667	0.0000	0.0000	0.0000	0.0000	24.9481	106.4938	192.6795	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												714.7827	
Space heating per m2											(98c) / (4) =	13.8042	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	184.6682	119.3984	69.4844	15.3434	1.7667	0.0000	0.0000	0.0000	0.0000	24.9481	106.4938	192.6795	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	184.6682	119.3984	69.4844	15.3434	1.7667	0.0000	0.0000	0.0000	0.0000	24.9481	106.4938	192.6795	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378	(231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												714.7827	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.5965	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.6389	(230a)
Total electricity for the above, kWh/year	94.6389	(231)
Electricity for lighting (calculated in Appendix L)	125.8149	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1490.8330	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	714.7827	0.1583	113.1434	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			191.5304	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			222.8169	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	714.7827	1.5859	1133.5916	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	1.5217	845.4483	(278)
Space and water heating			1979.0399	(279)
Pumps, fans and electric keep-hot	94.6389	1.5128	143.1698	(281)
Energy for lighting	125.8149	1.5338	192.9790	(282)
Total Primary energy kWh/year			2315.1887	(286)
Dwelling Primary energy Rate (DPER)			44.7100	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b) x	2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.0390	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1515	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4015	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3412	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4351	0.4266	0.4180	0.3754	0.3668	0.3242	0.3242	0.3157	0.3412	0.3668	0.3839	0.4010	(22b)
Effective ac	0.5947	0.5910	0.5874	0.5705	0.5673	0.5525	0.5525	0.5498	0.5582	0.5673	0.5737	0.5804	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8900	1.1450	12.4695			(27)
Brickwork	31.4100	10.8900	20.5200	0.1800	3.6936			(29a)
Communal Wall	18.1100	2.0600	16.0500	0.1800	2.8890			(29a)
Smoke Shaft Wall	3.9300		3.9300	0.1800	0.7074			(29a)
Total net area of external elements Aum(A, m2)			53.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.8195			(33)
Main dwelling								
Party Wall 1			35.2900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 272.7926 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	34.3000	0.0700	2.4010
E16 Corner (normal)	5.7600	0.0900	0.5184
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0900	-0.2592
E18 Party wall between dwellings	5.7600	0.0600	0.3456
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.6900	0.0500	0.6845
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6600	0.0200	0.0532
E25 Staggered party wall between dwellings	5.7600	0.0600	0.3456

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.3886 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 26.2081 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9107	25.7506	25.5936	24.8563	24.7183	24.0761	24.0761	23.9572	24.3235	24.7183	24.9974	25.2892	(38)
Heat transfer coeff	52.1188	51.9587	51.8017	51.0643	50.9264	50.2842	50.2842	50.1653	50.5316	50.9264	51.2055	51.4972	(39)

Average = Sum(39)m / 12 = 51.0637

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0065	1.0035	1.0004	0.9862	0.9835	0.9711	0.9711	0.9688	0.9759	0.9835	0.9889	0.9945	(40)
HLP (average)												0.9862	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

Hot water usage for mixer showers

53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

219.2487	194.0085	206.2147	181.3616	175.8871	158.5604	156.4492	162.5591	164.2478	183.0838	194.6256	216.8439	(62)
WWHRS -24.4291	-21.6053	-22.6238	-18.7334	-17.4589	-14.9397	-14.0036	-14.8914	-15.4572	-18.2223	-20.6436	-23.9767	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
194.8196	172.4032	183.5909	162.6281	158.4283	143.6208	142.4457	147.6678	148.7906	164.8615	173.9820	192.8672	(64)
									Total per year (kWh/year) = Sum(64)m =		1986.1055	(64)
12Total per year (kWh/year)											1986	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

94.6833	84.1829	90.3495	81.3832	80.2656	73.8018	73.8025	75.8340	75.6928	82.6585	85.7935	93.8837	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	87.1290	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7956	85.0237	76.7956	79.3555	76.7956	79.3555	76.7956	76.7956	79.3555	76.7956	79.3555	76.7956	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.8552	153.4310	149.4601	141.0065	130.3353	120.3059	113.6056	112.0299	116.0008	124.4544	135.1256	145.1550	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	31.7129	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)	127.2625	125.2722	121.4375	113.0322	107.8838	102.5025	99.1969	101.9275	105.1289	111.1001	119.1576	126.1878	(72)

Total internal gains	408.0521	415.8656	399.8319	385.5328	367.1535	351.3026	338.7369	339.8917	349.6239	364.4889	385.7774	400.2771 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.8900	19.6403	0.6300	0.7000	0.7700	65.3653	(76)

Solar gains	65.3653	127.8683	210.5809	307.1197	376.3867	385.2988	366.8202	315.0931	244.9143	151.7265	81.5028	53.7532 (83)
Total gains	473.4174	543.7339	610.4128	692.6525	743.5402	736.6014	705.5571	654.9848	594.5382	516.2154	467.2802	454.0303 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2831	75.5152	75.7440	76.8377	77.0458	78.0298	78.0298	78.2148	77.6478	77.0458	76.6259	76.1918	
alpha	6.0189	6.0343	6.0496	6.1225	6.1364	6.2020	6.2020	6.2143	6.1765	6.1364	6.1084	6.0795	
util living area	0.9882	0.9727	0.9305	0.8061	0.6218	0.4354	0.3134	0.3520	0.5773	0.8707	0.9723	0.9905	(86)
MIT	20.2032	20.3907	20.6371	20.8818	20.9776	20.9979	20.9998	20.9995	20.9891	20.8406	20.4890	20.1760	(87)
Th 2	20.0779	20.0805	20.0830	20.0949	20.0971	20.1075	20.1075	20.1094	20.1035	20.0971	20.0926	20.0879	(88)
util rest of house	0.9844	0.9645	0.9114	0.7656	0.5668	0.3754	0.2499	0.2840	0.5063	0.8304	0.9626	0.9874	(89)
MIT 2	19.1730	19.4088	19.7085	19.9894	20.0812	20.1065	20.1074	20.1093	20.0975	19.9568	19.5436	19.1465	(90)
Living area fraction									fLA = Living area / (4) =			0.4627	(91)
MIT	19.6497	19.8631	20.1382	20.4023	20.4960	20.5189	20.5203	20.5212	20.5101	20.3658	19.9810	19.6229	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6497	19.8631	20.1382	20.4023	20.4960	20.5189	20.5203	20.5212	20.5101	20.3658	19.9810	19.6229	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9822	0.9622	0.9127	0.7800	0.5915	0.4032	0.2793	0.3155	0.5389	0.8434	0.9611	0.9854	(94)
Useful gains	464.9874	523.1783	557.1042	540.2766	439.7845	296.9852	197.0785	206.6329	320.4026	435.3535	449.1202	447.4118	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	800.0066	777.4645	706.4805	587.3595	447.9501	297.6289	197.1308	206.7422	323.9111	497.3367	659.5789	794.2353	(97)
Space heating kWh	249.2543	170.8803	111.1359	33.8997	6.0752	0.0000	0.0000	0.0000	0.0000	46.1155	151.5303	258.0367	(98a)
Space heating requirement - total per year (kWh/year)												1026.9278	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.2543	170.8803	111.1359	33.8997	6.0752	0.0000	0.0000	0.0000	0.0000	46.1155	151.5303	258.0367	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1026.9278	
Space heating per m2										(98c) / (4) =		19.8325	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	249.2543	170.8803	111.1359	33.8997	6.0752	0.0000	0.0000	0.0000	0.0000	46.1155	151.5303	258.0367	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	270.0480	185.1357	120.4073	36.7277	6.5820	0.0000	0.0000	0.0000	0.0000	49.9626	164.1715	279.5630	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	194.8196	172.4032	183.5909	162.6281	158.4283	143.6208	142.4457	147.6678	148.7906	164.8615	173.9820	192.8672	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6134	84.0399	82.9710	81.2199	80.0998	79.8000	79.8000	79.8000	79.8000	81.6079	83.7514	84.7134	(217)
Fuel for water heating, kWh/month	230.2466	205.1445	221.2712	200.2318	197.7886	179.9759	178.5034	185.0473	186.4544	202.0167	207.7361	227.6703	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9566	12.8010	11.5259	8.4443	6.5227	5.3291	5.9502	7.7343	10.0461	13.1810	14.8879	16.4001	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0107	-20.8327	-31.5710	-37.5014	-42.2255	-40.0921	-39.6239	-36.5254	-31.3627	-24.7092	-15.7887	-11.9918	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9433	-10.6372	-21.5862	-33.0751	-44.3680	-44.7925	-44.2453	-37.1547	-26.8455	-15.4032	-6.6625	-3.8902	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1112.5978	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2422.0868	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.7790	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-639.8390	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3109.6246	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1112.5978	0.2100	233.6455	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2422.0868	0.2100	508.6382	(264)
Space and water heating			742.2838	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.7790	0.1443	18.5868	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.2352	0.1335	-46.2094	
PV Unit electricity exported	-293.6039	0.1253	-36.7965	
Total			-83.0059	(269)
Total CO2, kg/year			689.7939	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1112.5978	1.1300	1257.2355	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2422.0868	1.1300	2736.9581	(278)
Space and water heating			3994.1936	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.7790	1.5338	197.5256	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.2352	1.4932	-516.9951	
PV Unit electricity exported	-293.6039	0.4600	-135.0606	
Total			-652.0558	(283)
Total Primary energy kWh/year			3669.7642	(286)
Target Primary Energy Rate (TPER)			70.8700	(287)

Full SAP Calculation Printout

Plot Reference	P-10	**Issued on Date**	24/04/2026
Assessment Reference	P-10-1C	**Plot Type Ref**	P-10
Plot Address	P-10, Carter's Site, Reading	**SAP Version**	10.2

SAP Rating	86 B	**DER**	4.30	**TER**	13.32
Environmental	97 A	**% DER < TER**			67.72
CO_2 Emissions (t/year)	0.18	**DFEE**	30.84	**TFEE**	29.10
Compliance Check	See BREL	**% DFEE < TFEE**			-6.01
% DPER < TPER	36.91	**DPER**	44.71	**TPER**	70.87

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0390	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2000	0.7860	110.0000	432.3000	(29a)
Total net area of external elements Aum(A, m2)			53.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.6119			(33)
Main dwelling								
Party Wall 1			35.2900	0.0000	0.0000	110.0000	3881.9001	(32)
Party Floor 1			51.7800			70.0000	3624.6000	(32d)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			80.4000			9.0000	723.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14125.2002 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		272.7926 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	34.3000	0.0380	1.3034
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6600	0.3300	0.8778
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.1289 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.7408 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0092	12.8703	12.7314	12.0370	11.8981	11.2037	11.2037	11.0648	11.4815	11.8981	12.1759	12.4537	(38)
Heat transfer coeff	41.7500	41.6111	41.4722	40.7778	40.6389	39.9445	39.9445	39.8056	40.2222	40.6389	40.9167	41.1945	(39)
Average = Sum(39)m / 12 =												40.7431	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8063	0.8036	0.8009	0.7875	0.7848	0.7714	0.7714	0.7687	0.7768	0.7848	0.7902	0.7956	(40)
HLP (average)												0.7868	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)
Hot water usage for baths	23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)
Hot water usage for other uses	32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)
Average daily hot water use (litres/day)												100.2104	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
									Total per year (kWh/year) = Sum(64)m =			2009.3981	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8104	15.8190	12.8649	9.7396	7.2804	6.1465	6.6415	8.6328	11.5869	14.7123	17.1714	18.3054	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6496	229.0015	223.0748	210.4574	194.5303	179.5610	169.5607	167.2087	173.1355	185.7528	201.6800	216.6492	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857	(72)
Total internal gains	403.6701	402.0403	389.3248	365.1768	341.6422	320.1576	307.3466	309.7166	321.7990	343.5129	369.9566	393.0900	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	19.6403	0.3100	0.0000	0.7700	55.8825	(76)

Solar gains	55.8825	109.3181	180.0313	262.5649	321.7831	329.4023	313.6044	269.3816	209.3838	129.7151	69.6789	45.9551	(83)
Total gains	459.5526	511.3584	569.3561	627.7417	663.4253	649.5599	620.9511	579.0982	531.1828	473.2280	439.6355	439.0451	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	93.9800	94.2937	94.6095	96.2207	96.5495	98.2280	98.2280	98.5708	97.5497	96.5495	95.8940	95.2474	
alpha	7.2653	7.2862	7.3073	7.4147	7.4366	7.5485	7.5485	7.5714	7.5033	7.4366	7.3929	7.3498	
util living area	0.9830	0.9630	0.9022	0.7535	0.5659	0.3934	0.2830	0.3162	0.5206	0.8261	0.9618	0.9868	(86)
MIT	20.4965	20.6358	20.8201	20.9580	20.9949	20.9997	21.0000	21.0000	20.9979	20.9347	20.6999	20.4682	(87)
Th 2	20.2479	20.2502	20.2525	20.2642	20.2665	20.2782	20.2782	20.2805	20.2735	20.2665	20.2618	20.2572	(88)
util rest of house	0.9780	0.9531	0.8804	0.7161	0.5227	0.3491	0.2366	0.2667	0.4666	0.7855	0.9499	0.9829	(89)
MIT 2	19.6785	19.8517	20.0705	20.2276	20.2629	20.2780	20.2782	20.2805	20.2723	20.2108	19.9427	19.6509	(90)
Living area fraction										fLA = Living area / (4) =		0.4627	(91)
MIT	20.0570	20.2145	20.4174	20.5656	20.6016	20.6120	20.6122	20.6134	20.6081	20.5458	20.2931	20.0291	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0570	20.2145	20.4174	20.5656	20.6016	20.6120	20.6122	20.6134	20.6081	20.5458	20.2931	20.0291	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9765	0.9526	0.8855	0.7318	0.5425	0.3696	0.2581	0.2896	0.4916	0.8017	0.9505	0.9815	(94)
Useful gains	448.7726	487.1258	504.1892	459.3775	359.9303	240.0623	160.2595	167.7071	261.1112	379.3752	417.8613	430.9107	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	657.8556	637.2552	577.1843	475.6963	361.7504	240.1451	160.2638	167.7171	261.7691	404.1847	539.8161	652.0714	(97)
Space heating kWh	155.5577	100.8870	54.3083	11.7495	1.3541	0.0000	0.0000	0.0000	0.0000	18.4582	87.8075	164.5436	(98a)
Space heating requirement - total per year (kWh/year)												594.6659	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	155.5577	100.8870	54.3083	11.7495	1.3541	0.0000	0.0000	0.0000	18.4582	87.8075		164.5436	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												594.6659	
Space heating per m2											(98c) / (4) =	11.4845	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	155.5577	100.8870	54.3083	11.7495	1.3541	0.0000	0.0000	0.0000	0.0000	18.4582	87.8075	164.5436	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	155.5577	100.8870	54.3083	11.7495	1.3541	0.0000	0.0000	0.0000	0.0000	18.4582	87.8075	164.5436	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378	(231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 594.6659 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 555.5965 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)

mechanical ventilation fans (SFP = 0.5875)	94.6389	(230a)
Total electricity for the above, kWh/year	94.6389	(231)
Electricity for lighting (calculated in Appendix L)	125.8149	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1370.7162	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	594.6659	16.4900	98.0604	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	16.4900	91.6179	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6389	16.4900	15.6060	(249)
Energy for lighting	125.8149	16.4900	20.7469	(250)
Additional standing charges			0.0000	(251)
Total energy cost			226.0311	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8408	(257)
SAP value		86.3709	
SAP rating (Section 12)		86	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	594.6659	0.1585	94.2558	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			172.6428	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			203.9293	(272)
CO2 emissions per m2			3.9400	(273)
EI value			97.1764	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.0390	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2699	0.2635	0.2635	0.2539	0.2539	0.2412	0.2444	0.2380	0.2412	0.2476	0.2476	0.2571	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2000	0.7860	110.0000	432.3000	(29a)
Total net area of external elements Aum(A, m2)			53.4500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.6119			(33)
Main dwelling								
Party Wall 1			35.2900	0.0000	0.0000	110.0000	3881.9001	(32)
Party Floor 1			51.7800			70.0000	3624.6000	(32d)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			80.4000			9.0000	723.6000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14125.2002 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 272.7926 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	34.3000	0.0380	1.3034
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6600	0.3300	0.8778
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.1289 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.7408 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.7592	11.4815	11.4815	11.0648	11.0648	10.5092	10.6481	10.3703	10.5092	10.7870	10.7870	11.2037	(38)
Heat transfer coeff	40.5000	40.2222	40.2222	39.8056	39.8056	39.2500	39.3889	39.1111	39.2500	39.5278	39.5278	39.9445	(39)

Average = Sum(39)m / 12 = 39.7130

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7822	0.7768	0.7768	0.7687	0.7687	0.7580	0.7607	0.7553	0.7580	0.7634	0.7634	0.7714	(40)
HLP (average)												0.7670	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7426 (42)
Hot water usage for mixer showers

53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day) 100.2104 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)

Total per year (kWh/year) = Sum(64)m = 2009.3981 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.8104	15.8190	12.8649	9.7396	7.2804	6.1465	6.6415	8.6328	11.5869	14.7123	17.1714	18.3054 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	226.6496	229.0015	223.0748	210.4574	194.5303	179.5610	169.5607	167.2087	173.1355	185.7528	201.6800	216.6492 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032 (71)

Water heating gains (Table 5)

	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857 (72)

Total internal gains

	403.6701	402.0403	389.3248	365.1768	341.6422	320.1576	307.3466	309.7166	321.7990	343.5129	369.9566	393.0900 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	22.3313	0.3100	0.0000	0.7700	63.5394	(76)

Solar gains	63.5394	111.8067	181.5544	272.0980	324.2163	354.9140	334.3433	294.1429	228.6264	141.5771	81.1638	51.7447	(83)
Total gains	467.2095	513.8471	570.8792	637.2748	665.8585	675.0716	641.6900	603.8595	550.4254	485.0900	451.1203	444.8347	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	96.8806	97.5497	97.5497	98.5708	98.5708	99.9660	99.6135	100.3209	99.9660	99.2635	99.2635	98.2280	
alpha	7.4587	7.5033	7.5033	7.5714	7.5714	7.6644	7.6409	7.6881	7.6644	7.6176	7.6176	7.5485	
util living area	0.9731	0.9473	0.8627	0.6794	0.4773	0.2907	0.1903	0.2073	0.4133	0.7398	0.9329	0.9786	(86)
MIT	20.6101	20.7265	20.8876	20.9817	20.9987	21.0000	21.0000	21.0000	20.9997	20.9738	20.8077	20.5877	(87)
Th 2	20.2688	20.2735	20.2735	20.2805	20.2805	20.2899	20.2875	20.2922	20.2899	20.2852	20.2852	20.2782	(88)
util rest of house	0.9655	0.9339	0.8351	0.6396	0.4348	0.2494	0.1466	0.1614	0.3629	0.6921	0.9138	0.9723	(89)
MIT 2	19.8374	19.9816	20.1649	20.2657	20.2797	20.2899	20.2875	20.2922	20.2897	20.2650	20.0906	19.8180	(90)
Living area fraction									fLA = Living area / (4) =			0.4627	(91)
MIT	20.1949	20.3263	20.4993	20.5970	20.6124	20.6185	20.6172	20.6197	20.6182	20.5930	20.4224	20.1741	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1949	20.3263	20.4993	20.5970	20.6124	20.6185	20.6172	20.6197	20.6182	20.5930	20.4224	20.1741	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9646	0.9350	0.8441	0.6573	0.4544	0.2685	0.1668	0.1826	0.3862	0.7131	0.9178	0.9713	(94)
Useful gains	450.6844	480.4337	481.8856	418.9116	302.5902	181.2687	107.0277	110.2824	212.5769	345.9227	414.0354	432.0530	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	611.3453	592.3247	526.8833	425.8006	303.0163	181.2743	107.0278	110.2826	212.6661	355.4734	491.0309	602.1285	(97)
Space heating kWh	119.5318	75.1907	33.4783	4.9601	0.3170	0.0000	0.0000	0.0000	0.0000	7.1057	55.4368	126.5362	(98a)
Space heating requirement - total per year (kWh/year)												422.5566	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	119.5318	75.1907	33.4783	4.9601	0.3170	0.0000	0.0000	0.0000	0.0000	7.1057	55.4368	126.5362	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.5566	
Space heating per m2											(98c) / (4) =	8.1606	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	119.5318	75.1907	33.4783	4.9601	0.3170	0.0000	0.0000	0.0000	0.0000	7.1057	55.4368	126.5362	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	119.5318	75.1907	33.4783	4.9601	0.3170	0.0000	0.0000	0.0000	0.0000	7.1057	55.4368	126.5362	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
201.9488 178.3828 188.9148 164.6197 158.5872 141.8186 139.1493 145.2592 147.5060 165.7839 177.8838 199.5440 (64)
Efficiency of water heater 361.6650 (216)
(217)m 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 (217)
Fuel for water heating, kWh/month
55.8386 49.3227 52.2347 45.5172 43.8492 39.2127 38.4747 40.1640 40.7852 45.8391 49.1847 55.1737 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 8.0378 7.2600 8.0378 7.7785 8.0378 7.7785 8.0378 8.0378 7.7785 8.0378 7.7785 8.0378 (231)
Lighting 15.5893 12.5063 11.2606 8.2500 6.3725 5.2064 5.8132 7.5563 9.8148 12.8776 14.5452 16.0226 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 422.5566 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 555.5965 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 94.6389 (230a)
Total electricity for the above, kWh/year 94.6389 (231)
Electricity for lighting (calculated in Appendix L) 125.8149 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1198.6069 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	422.5566	27.6700	116.9214	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	27.6700	153.7335	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6389	27.6700	26.1866	(249)
Energy for lighting	125.8149	27.6700	34.8130	(250)
Additional standing charges			0.0000	(251)
Total energy cost			331.6545	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	422.5566	0.1594	67.3502	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			145.7372	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			177.0238	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	422.5566	1.5900	671.8446	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	1.5217	845.4483	(278)
Space and water heating			1517.2929	(279)
Pumps, fans and electric keep-hot	94.6389	1.5128	143.1698	(281)
Energy for lighting	125.8149	1.5338	192.9790	(282)
Total Primary energy kWh/year			1853.4417	(286)

SAP 10 EPC IMPROVEMENTS

P-10-1C

Current energy efficiency rating: B 86
Current environmental impact rating: A 97

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£332	£332	£0
Space heating	£143	£143	£0
Water heating	£154	£154	£0
Lighting	£35	£35	£0
Total cost of fuels	£332	£332	£0
Total cost of uses	£332	£332	£0
Delivered energy	23 kWh/m²	23 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	36 kWh/m²	36 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	132.0390	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2000	0.7860	110.0000	432.3000	(29a)
Total net area of external elements Aum(A, m2)			53.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.6119			(33)
Main dwelling								
Party Wall 1			35.2900	0.0000	0.0000	110.0000	3881.9001	(32)
Party Floor 1			51.7800			70.0000	3624.6000	(32d)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			80.4000			9.0000	723.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14125.2002 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		272.7926 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	34.3000	0.0380	1.3034
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6600	0.3300	0.8778
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.1289 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	28.7408 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.0092	12.8703	12.7314	12.0370	11.8981	11.2037	11.2037	11.0648	11.4815	11.8981	12.1759	12.4537	(38)
Heat transfer coeff	41.7500	41.6111	41.4722	40.7778	40.6389	39.9445	39.9445	39.8056	40.2222	40.6389	40.9167	41.1945	(39)
Average = Sum(39)m / 12 =												40.7431	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8063	0.8036	0.8009	0.7875	0.7848	0.7714	0.7714	0.7687	0.7768	0.7848	0.7902	0.7956	(40)
HLP (average)												0.7868	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7426 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)
Hot water usage for baths												
23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)
Hot water usage for other uses												
32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)
Average daily hot water use (litres/day)												100.2104	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m													
	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
									Total per year (kWh/year) = Sum(64)m =			2009.3981	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8104	15.8190	12.8649	9.7396	7.2804	6.1465	6.6415	8.6328	11.5869	14.7123	17.1714	18.3054	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.6496	229.0015	223.0748	210.4574	194.5303	179.5610	169.5607	167.2087	173.1355	185.7528	201.6800	216.6492	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)													

	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857 (72)
Total internal gains	403.6701	402.0403	389.3248	365.1768	341.6422	320.1576	307.3466	309.7166	321.7990	343.5129	369.9566	393.0900 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	19.6403	0.3100	0.0000	0.7700	55.8825	(76)

Solar gains	55.8825	109.3181	180.0313	262.5649	321.7831	329.4023	313.6044	269.3816	209.3838	129.7151	69.6789	45.9551 (83)
Total gains	459.5526	511.3584	569.3561	627.7417	663.4253	649.5599	620.9511	579.0982	531.1828	473.2280	439.6355	439.0451 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	93.9800	94.2937	94.6095	96.2207	96.5495	98.2280	98.2280	98.5708	97.5497	96.5495	95.8940	95.2474	
alpha	7.2653	7.2862	7.3073	7.4147	7.4366	7.5485	7.5485	7.5714	7.5033	7.4366	7.3929	7.3498	
util living area	0.9830	0.9630	0.9022	0.7535	0.5659	0.3934	0.2830	0.3162	0.5206	0.8261	0.9618	0.9868	(86)
MIT	20.4965	20.6358	20.8201	20.9580	20.9949	20.9997	21.0000	21.0000	20.9979	20.9347	20.6999	20.4682	(87)
Th 2	20.2479	20.2502	20.2525	20.2642	20.2665	20.2782	20.2782	20.2805	20.2735	20.2665	20.2618	20.2572	(88)
util rest of house	0.9780	0.9531	0.8804	0.7161	0.5227	0.3491	0.2366	0.2667	0.4666	0.7855	0.9499	0.9829	(89)
MIT 2	19.6785	19.8517	20.0705	20.2276	20.2629	20.2780	20.2782	20.2805	20.2723	20.2108	19.9427	19.6509	(90)
Living area fraction									fLA = Living area / (4) =			0.4627	(91)
MIT	20.0570	20.2145	20.4174	20.5656	20.6016	20.6120	20.6122	20.6134	20.6081	20.5458	20.2931	20.0291	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0570	20.2145	20.4174	20.5656	20.6016	20.6120	20.6122	20.6134	20.6081	20.5458	20.2931	20.0291	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9765	0.9526	0.8855	0.7318	0.5425	0.3696	0.2581	0.2896	0.4916	0.8017	0.9505	0.9815	(94)
Useful gains	448.7726	487.1258	504.1892	459.3775	359.9303	240.0623	160.2595	167.7071	261.1112	379.3752	417.8613	430.9107	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	657.8556	637.2552	577.1843	475.6963	361.7504	240.1451	160.2638	167.7171	261.7691	404.1847	539.8161	652.0714	(97)
Space heating kWh	155.5577	100.8870	54.3083	11.7495	1.3541	0.0000	0.0000	0.0000	0.0000	18.4582	87.8075	164.5436	(98a)
Space heating requirement - total per year (kWh/year)												594.6659	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	155.5577	100.8870	54.3083	11.7495	1.3541	0.0000	0.0000	0.0000	0.0000	18.4582	87.8075	164.5436	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												594.6659	
Space heating per m2											(98c) / (4) =	11.4845	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	155.5577	100.8870	54.3083	11.7495	1.3541	0.0000	0.0000	0.0000	0.0000	18.4582	87.8075	164.5436	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	155.5577	100.8870	54.3083	11.7495	1.3541	0.0000	0.0000	0.0000	0.0000	18.4582	87.8075	164.5436	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378	(231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	594.6659	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.5965	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.6389	(230a)
Total electricity for the above, kWh/year	94.6389	(231)
Electricity for lighting (calculated in Appendix L)	125.8149	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1370.7162	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	594.6659	16.4900	98.0604	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	16.4900	91.6179	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6389	16.4900	15.6060	(249)
Energy for lighting	125.8149	16.4900	20.7469	(250)
Additional standing charges			0.0000	(251)
Total energy cost			226.0311	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8408	(257)
SAP value		86.3709	
SAP rating (Section 12)		86	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	594.6659	0.1585	94.2558	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			172.6428	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			203.9293	(272)
CO2 emissions per m2			3.9400	(273)
EI value			97.1764	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		51.7800	(1b)	x 2.5500	(2b) =	132.0390	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.7800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.0390	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.1339	0.1275	0.1275	0.1179	0.1179	0.1052	0.1084	0.1020	0.1052	0.1116	0.1116	0.1211	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2699	0.2635	0.2635	0.2539	0.2539	0.2412	0.2444	0.2380	0.2412	0.2476	0.2476	0.2571	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2000	0.7860	110.0000	432.3000	(29a)
Total net area of external elements Aum(A, m2)			53.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.6119			(33)
Main dwelling								
Party Wall 1			35.2900	0.0000	0.0000	110.0000	3881.9001	(32)
Party Floor 1			51.7800			70.0000	3624.6000	(32d)
Party Ceiling 1			51.7800			30.0000	1553.4000	(32b)
Internal Wall 1			80.4000			9.0000	723.6000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14125.2002	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	272.7926	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	34.3000	0.0380	1.3034
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9900	0.0500	0.2995
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6600	0.3300	0.8778
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.1289	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	28.7408	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.7592	11.4815	11.4815	11.0648	11.0648	10.5092	10.6481	10.3703	10.5092	10.7870	10.7870	11.2037	(38)
Heat transfer coeff	40.5000	40.2222	40.2222	39.8056	39.8056	39.2500	39.3889	39.1111	39.2500	39.5278	39.5278	39.9445	(39)
Average = Sum(39)m / 12 =												39.7130	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7822	0.7768	0.7768	0.7687	0.7687	0.7580	0.7607	0.7553	0.7580	0.7634	0.7634	0.7714	(40)
HLP (average)												0.7670	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7426	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.4368	52.6338	51.4636	49.2246	47.5723	45.7297	44.6823	45.8437	47.1167	49.0951	51.3822	53.2321	(42a)

Hot water usage for baths

23.1028	22.7597	22.2765	21.3857	20.7186	19.9789	19.5794	20.0591	20.5816	21.3730	22.2823	23.0247	(42b)

Hot water usage for other uses

32.4758	31.2948	30.1139	28.9330	27.7520	26.5711	26.5711	27.7520	28.9330	30.1139	31.2948	32.4758	(42c)

Average daily hot water use (litres/day)	100.2104	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0154	106.6883	103.8540	99.5432	96.0429	92.2797	90.8328	93.6548	96.6312	100.5821	104.9593	108.7326	(44)
Energy conte	172.6538	151.9228	159.6198	136.2697	129.2922	113.4686	109.8543	115.9642	119.1560	136.4889	149.5338	170.2490	(45)
Energy content (annual)										Total = Sum(45)m =		1664.4731	
Distribution loss (46)m = 0.15 x (45)m	25.8981	22.7884	23.9430	20.4405	19.3938	17.0203	16.4782	17.3946	17.8734	20.4733	22.4301	25.5373	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)

Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
										Total per year (kWh/year) = Sum(64)m =		2009.3981	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.4074	50.5143	53.0736	45.3097	42.9897	37.7283	36.5266	38.5581	39.6194	45.3826	49.7200	56.6078	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	104.5548	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8104	15.8190	12.8649	9.7396	7.2804	6.1465	6.6415	8.6328	11.5869	14.7123	17.1714	18.3054	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.6496	229.0015	223.0748	210.4574	194.5303	179.5610	169.5607	167.2087	173.1355	185.7528	201.6800	216.6492	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	47.1981	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	-69.7032	(71)
Water heating gains (Table 5)													
	77.1605	75.1701	71.3354	62.9301	57.7818	52.4004	49.0949	51.8254	55.0269	60.9981	69.0555	76.0857	(72)
Total internal gains													
	403.6701	402.0403	389.3248	365.1768	341.6422	320.1576	307.3466	309.7166	321.7990	343.5129	369.9566	393.0900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	22.3313	0.3100	0.0000	0.7700	63.5394	(76)

Solar gains	63.5394	111.8067	181.5544	272.0980	324.2163	354.9140	334.3433	294.1429	228.6264	141.5771	81.1638	51.7447	(83)
Total gains	467.2095	513.8471	570.8792	637.2748	665.8585	675.0716	641.6900	603.8595	550.4254	485.0900	451.1203	444.8347	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	96.8806	97.5497	97.5497	98.5708	98.5708	99.9660	99.6135	100.3209	99.9660	99.2635	99.2635	98.2280	
alpha	7.4587	7.5033	7.5033	7.5714	7.5714	7.6644	7.6409	7.6881	7.6644	7.6176	7.6176	7.5485	
util living area													
	0.9731	0.9473	0.8627	0.6794	0.4773	0.2907	0.1903	0.2073	0.4133	0.7398	0.9329	0.9786	(86)
MIT	20.6101	20.7265	20.8876	20.9817	20.9987	21.0000	21.0000	21.0000	20.9997	20.9738	20.8077	20.5877	(87)
Th 2	20.2688	20.2735	20.2735	20.2805	20.2805	20.2899	20.2875	20.2922	20.2899	20.2852	20.2852	20.2782	(88)
util rest of house													
	0.9655	0.9339	0.8351	0.6396	0.4348	0.2494	0.1466	0.1614	0.3629	0.6921	0.9138	0.9723	(89)
MIT 2	19.8374	19.9816	20.1649	20.2657	20.2797	20.2899	20.2875	20.2922	20.2897	20.2650	20.0906	19.8180	(90)
Living area fraction										fLA = Living area / (4) =		0.4627	(91)
MIT	20.1949	20.3263	20.4993	20.5970	20.6124	20.6185	20.6172	20.6197	20.6182	20.5930	20.4224	20.1741	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1949	20.3263	20.4993	20.5970	20.6124	20.6185	20.6172	20.6197	20.6182	20.5930	20.4224	20.1741	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9646	0.9350	0.8441	0.6573	0.4544	0.2685	0.1668	0.1826	0.3862	0.7131	0.9178	0.9713	(94)
Useful gains	450.6844	480.4337	481.8856	418.9116	302.5902	181.2687	107.0277	110.2824	212.5769	345.9227	414.0354	432.0530	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W													
	611.3453	592.3247	526.8833	425.8006	303.0163	181.2743	107.0278	110.2826	212.6661	355.4734	491.0309	602.1285	(97)
Space heating kWh													
	119.5318	75.1907	33.4783	4.9601	0.3170	0.0000	0.0000	0.0000	0.0000	7.1057	55.4368	126.5362	(98a)
Space heating requirement - total per year (kWh/year)												422.5566	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	119.5318	75.1907	33.4783	4.9601	0.3170	0.0000	0.0000	0.0000	0.0000	7.1057	55.4368	126.5362	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.5566	
Space heating per m2											(98c) / (4) =	8.1606	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)

Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	119.5318	75.1907	33.4783	4.9601	0.3170	0.0000	0.0000	0.0000	0.0000	7.1057	55.4368	126.5362	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	119.5318	75.1907	33.4783	4.9601	0.3170	0.0000	0.0000	0.0000	0.0000	7.1057	55.4368	126.5362	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	201.9488	178.3828	188.9148	164.6197	158.5872	141.8186	139.1493	145.2592	147.5060	165.7839	177.8838	199.5440	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.8386	49.3227	52.2347	45.5172	43.8492	39.2127	38.4747	40.1640	40.7852	45.8391	49.1847	55.1737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0378	7.2600	8.0378	7.7785	8.0378	7.7785	8.0378	8.0378	7.7785	8.0378	7.7785	8.0378	(231)
Lighting	15.5893	12.5063	11.2606	8.2500	6.3725	5.2064	5.8132	7.5563	9.8148	12.8776	14.5452	16.0226	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	422.5566 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	361.6650
Water heating fuel used	555.5965 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)	
mechanical ventilation fans (SFP = 0.5875)	94.6389 (230a)
Total electricity for the above, kWh/year	94.6389 (231)
Electricity for lighting (calculated in Appendix L)	125.8149 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1198.6069 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	422.5566	27.6700	116.9214	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	27.6700	153.7335	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6389	27.6700	26.1866	(249)
Energy for lighting	125.8149	27.6700	34.8130	(250)
Additional standing charges			0.0000	(251)
Total energy cost			331.6545	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	422.5566	0.1594	67.3502	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.5965	0.1411	78.3870	(264)
Space and water heating			145.7372	(265)
Pumps, fans and electric keep-hot	94.6389	0.1387	13.1276	(267)
Energy for lighting	125.8149	0.1443	18.1590	(268)
Total CO2, kg/year			177.0238	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	422.5566	1.5900	671.8446	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.5965	1.5217	845.4483	(278)
Space and water heating			1517.2929	(279)
Pumps, fans and electric keep-hot	94.6389	1.5128	143.1698	(281)
Energy for lighting	125.8149	1.5338	192.9790	(282)
Total Primary energy kWh/year			1853.4417	(286)

Summary for Input Data

Plot Reference	P-11	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-11
Plot Address	Flat 6, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.28	**TER**	13.88
Environmental	96 A	**% DER < TER**			61.96
CO_2 Emissions (t/year)	0.3	**DFEE**	38.90	**TFEE**	38.51
Compliance Check	See BREL	**% DFEE < TFEE**			-1.02
% DPER < TPER	26.03	**DPER**	54.48	**TPER**	73.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	20.99 m	71.55 m²	2.55 m

8.0 Living Area 26.30 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	30.72	19.85	0.00	None	10.87	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	20.31	18.16	0.50	Stairwell Access Corridor 1	2.15	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	10.39	10.39	0.70	Stairwell Access Corridor 3	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	39.97	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	157.90

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	71.55

11.0 Heat Loss Floors

Summary for Input Data

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Exposed Floor	Exposed Floor - Solid	Lowest occupied	Other	0.14	Garage Single 1 Inside	0.70	110.00	71.55

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	North	2.15	
Patio Door	Patio Door	Brickwork	West	5.42	
West	Window	Brickwork	West	5.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	20.99	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	11.70	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	13.66	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	2.59	0.33	0.33	Abbey Calculated	No
E2 Other lintels (including other steel lintels)	Independently assessed	5.55	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.60	0.02	0.02	RCD	Yes
E20 Exposed floor (normal)	Independently assessed	18.40	0.12	0.12	-	No
P7 Party Wall - Exposed floor (normal)	Table K1 - Default	13.66	0.48	0.48	-	No
E16 Corner (normal)	Gov Approved Scheme	8.55	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.85	-0.10	-0.10	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0

Summary for Input Data

elmhurst energy

Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.90	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

Summary for Input Data

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-11	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-11
Plot Address	Flat 6, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.28	**TER**	13.88
Environmental	96 A	**% DER < TER**			61.96
CO_2 Emissions (t/year)	0.3	**DFEE**	38.90	**TFEE**	38.51
Compliance Check	See BREL	**% DFEE < TFEE**			-1.02
% DPER < TPER	26.03	**DPER**	54.48	**TPER**	73.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.5500 (1b)	x	2.5500 (2b)	=	182.4525	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4525	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9000	(17)
Infiltration rate		0.1450	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1232	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1571	0.1541	0.1510	0.1356	0.1325	0.1171	0.1171	0.1140	0.1232	0.1325	0.1387	0.1448	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2931	0.2901	0.2870	0.2716	0.2685	0.2531	0.2531	0.2500	0.2592	0.2685	0.2747	0.2808	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Exposed Floor			71.5500	0.1275	9.1230	110.0000	7870.5000	(28b)
Brickwork	30.7200	10.8700	19.8500	0.2100	4.1685	110.0000	2183.4999	(29a)
Communal Wall	20.3100	2.1500	18.1600	0.2200	3.9952	110.0000	1997.5999	(29a)
Lift Shaft Wall	10.3900		10.3900	0.2100	2.1819	110.0000	1142.9000	(29a)
Total net area of external elements Aum(A, m2)			132.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.4951			(33)
Main dwelling								
Party Wall 1			39.9700	0.0000	0.0000	110.0000	4396.7001	(32)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	21158.8000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 295.7205 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	20.9900	0.0380	0.7976
E18	Party wall between dwellings	11.7000	0.0380	0.4446
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6600	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2	Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4	Jamb	18.6000	0.0160	0.2976
E20	Exposed floor (normal)	18.4000	0.1200	2.2080
P7	Party Wall - Exposed floor (normal)	13.6600	0.4800	6.5568
E16	Corner (normal)	8.5500	0.0540	0.4617
E17	Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E25	Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7104 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.2055 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.6500	17.4645	17.2789	16.3513	16.1658	15.2382	15.2382	15.0527	15.6093	16.1658	16.5369	16.9079	(38)
Heat transfer coeff	63.8555	63.6700	63.4845	62.5569	62.3714	61.4438	61.4438	61.2582	61.8148	62.3714	62.7424	63.1134	(39)

Average = Sum(39)m / 12 = 62.5105

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8925	0.8899	0.8873	0.8743	0.8717	0.8588	0.8588	0.8562	0.8639	0.8717	0.8769	0.8821	(40)
HLP (average)												0.8737	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2832 (42)
Hot water usage for mixer showers

62.5007	61.5615	60.1928	57.5740	55.6415	53.4863	52.2613	53.6196	55.1086	57.4226	60.0976	62.2613	(42a)

Hot water usage for baths

27.0006	26.5996	26.0349	24.9937	24.2141	23.3496	22.8827	23.4434	24.0539	24.9790	26.0416	26.9093	(42b)

Hot water usage for other uses

38.0118	36.6296	35.2473	33.8651	32.4828	31.1006	31.1006	32.4828	33.8651	35.2473	36.6296	38.0118	(42c)

Average daily hot water use (litres/day) 117.2136 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5132	124.7906	121.4750	116.4328	112.3384	107.9365	106.2445	109.5458	113.0276	117.6489	122.7688	127.1824	(44)
Energy conte	201.9497	177.7002	186.7026	159.3907	151.2291	132.7205	128.4936	135.6406	139.3744	159.6485	174.9066	199.1369	(45)

Energy content (annual) Total = Sum(45)m = 1946.8933

Distribution loss (46)m = 0.15 x (45)m	30.2924	26.6550	28.0054	23.9086	22.6844	19.9081	19.2740	20.3461	20.9062	23.9473	26.2360	29.8705	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)

Total per year (kWh/year) = Sum(64)m = 2291.8183 (64)
12Total per year (kWh/year) 2292 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

67.1483	59.0853	62.0786	52.9974	50.2837	44.1296	42.7241	45.1005	46.3420	53.0831	58.1565	66.2130	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.8258	118.2715	106.8258	110.3867	106.8258	110.3867	106.8258	106.8258	110.3867	106.8258	110.3867	106.8258	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8873	202.9719	197.7188	186.5356	172.4188	159.1511	150.2874	148.2028	153.4559	164.6391	178.7558	192.0236	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	(71)
Water heating gains (Table 5)	90.2530	87.9246	83.4390	73.6075	67.5856	61.2911	57.4249	60.6190	64.3639	71.3483	80.7729	88.9960	(72)
Total internal gains	455.2135	466.4153	445.2310	427.7772	404.0776	388.0762	371.7855	372.8950	385.4538	400.0606	427.1628	445.0928	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)

West				5.4500		19.6403		0.3300		0.0000		0.7700	27.1987 (80)
Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107 (83)	
Total gains	509.4613	572.5354	619.9956	682.6610	716.4473	707.8421	676.2157	634.3960	588.7123	525.9810	494.8033	489.7035 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	92.0429	92.3110	92.5808	93.9536	94.2331	95.6557	95.6557	95.9454	95.0815	94.2331	93.6758	93.1251	
alpha	7.1362	7.1541	7.1721	7.2636	7.2822	7.3770	7.3770	7.3964	7.3388	7.2822	7.2451	7.2083	
util living area	0.9973	0.9931	0.9800	0.9193	0.7695	0.5523	0.3995	0.4436	0.7044	0.9501	0.9928	0.9979	(86)
MIT	20.2380	20.3766	20.5725	20.8229	20.9607	20.9968	20.9997	20.9995	20.9838	20.7960	20.4788	20.2185	(87)
Th 2	20.1739	20.1761	20.1783	20.1894	20.1916	20.2027	20.2027	20.2049	20.1983	20.1916	20.1872	20.1828	(88)
util rest of house	0.9963	0.9906	0.9727	0.8934	0.7160	0.4851	0.3273	0.3673	0.6314	0.9279	0.9897	0.9972	(89)
MIT 2	19.2876	19.4656	19.7133	20.0201	20.1623	20.2012	20.2026	20.2048	20.1890	19.9979	19.6052	19.2697	(90)
Living area fraction										fLA = Living area / (4) =		0.3676	(91)
MIT	19.6369	19.8005	20.0292	20.3152	20.4558	20.4936	20.4956	20.4969	20.4811	20.2913	19.9263	19.6185	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6369	19.8005	20.0292	20.3152	20.4558	20.4936	20.4956	20.4969	20.4811	20.2913	19.9263	19.6185	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9891	0.9711	0.8978	0.7342	0.5098	0.3539	0.3953	0.6579	0.9310	0.9884	0.9965	(94)
Useful gains	507.1446	566.3115	602.0963	612.9084	526.0069	360.8627	239.2894	250.8083	387.3052	489.7135	489.0803	487.9741	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	979.3480	948.7152	858.8912	714.0982	546.1094	362.1273	239.3622	250.9676	394.4477	604.4589	804.7552	973.1121	(97)
Space heating kWh	351.3194	256.9753	191.0554	72.8567	14.9562	0.0000	0.0000	0.0000	0.0000	85.3706	227.2860	360.9427	(98a)
Space heating requirement - total per year (kWh/year)												1560.7622	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.3194	256.9753	191.0554	72.8567	14.9562	0.0000	0.0000	0.0000	0.0000	85.3706	227.2860	360.9427	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1560.7622	
Space heating per m2										(98c) / (4) =		21.8136	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.3194	256.9753	191.0554	72.8567	14.9562	0.0000	0.0000	0.0000	0.0000	85.3706	227.2860	360.9427	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	351.3194	256.9753	191.0554	72.8567	14.9562	0.0000	0.0000	0.0000	0.0000	85.3706	227.2860	360.9427	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	63.9389	56.4501	59.7231	51.9101	49.9147	44.5358	43.6284	45.6045	46.3756	52.2427	56.2002	63.1612	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.1067	10.0319	11.1067	10.7485	11.1067	10.7485	11.1067	11.1067	10.7485	11.1067	10.7485	11.1067	(231)
Lighting	21.7426	17.4427	15.7052	11.5063	8.8878	7.2614	8.1078	10.5388	13.6888	17.9605	20.2864	22.3469	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1560.7622	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	361.6650	
Water heating fuel used	633.6854	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	130.7728	(230a)
Total electricity for the above, kWh/year	130.7728	(231)
Electricity for lighting (calculated in Appendix L)	175.4754	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2500.6958	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1560.7622	0.1568	244.7695	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.6854	0.1411	89.4427	(264)
Space and water heating			334.2122	(265)
Pumps, fans and electric keep-hot	130.7728	0.1387	18.1398	(267)
Energy for lighting	175.4754	0.1443	25.3265	(268)
Total CO2, kg/year			377.6785	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1560.7622	1.5806	2466.9217	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.6854	1.5219	964.4198	(278)
Space and water heating			3431.3415	(279)
Pumps, fans and electric keep-hot	130.7728	1.5128	197.8331	(281)
Energy for lighting	175.4754	1.5338	269.1500	(282)
Total Primary energy kWh/year			3898.3246	(286)
Dwelling Primary energy Rate (DPER)			54.4800	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.5500	(1b)	x 2.5500	(2b) =	182.4525	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		182.4525	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1644	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4144	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3523	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4491	0.4403	0.4315	0.3875	0.3787	0.3346	0.3346	0.3258	0.3523	0.3787	0.3963	0.4139	(22b)

Effective ac	0.6009	0.5969	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5620	0.5717	0.5785	0.5857 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
Exposed Floor			71.5500	0.1300	9.3015			(28b)
Brickwork	30.7200	10.8700	19.8500	0.1800	3.5730			(29a)
Communal Wall	20.3100	2.1500	18.1600	0.1800	3.2688			(29a)
Lift Shaft Wall	10.3900		10.3900	0.1800	1.8702			(29a)
Total net area of external elements Aum(A, m2)			132.9700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.6101			(33)
Main dwelling								
Party Wall 1			39.9700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	295.7205	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	20.9900	0.0700	1.4693
E18 Party wall between dwellings	11.7000	0.0600	0.7020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.0200	0.0518
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0500	0.9300
E20 Exposed floor (normal)	18.4000	0.3200	5.8880
P7 Party Wall - Exposed floor (normal)	13.6600	0.1600	2.1856
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.1882	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.7983	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1774	35.9416	35.7105	34.6248	34.4217	33.4761	33.4761	33.3010	33.8403	34.4217	34.8326	35.2622	(38)
Heat transfer coeff	80.9757	80.7399	80.5087	79.4231	79.2199	78.2744	78.2744	78.0992	78.6386	79.2199	79.6309	80.0605	(39)
Average = Sum(39)m / 12 =												79.4221	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1317	1.1284	1.1252	1.1100	1.1072	1.0940	1.0940	1.0915	1.0991	1.1072	1.1129	1.1189	(40)
HLP (average)												1.1100	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2832	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.5007	61.5615	60.1928	57.5740	55.6415	53.4863	52.2613	53.6196	55.1086	57.4226	60.0976	62.2613	(42a)
Hot water usage for baths	27.0006	26.5996	26.0349	24.9937	24.2141	23.3496	22.8827	23.4434	24.0539	24.9790	26.0416	26.9093	(42b)
Hot water usage for other uses	38.0118	36.6296	35.2473	33.8651	32.4828	31.1006	31.1006	32.4828	33.8651	35.2473	36.6296	38.0118	(42c)
Average daily hot water use (litres/day)												117.2136	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5132	124.7906	121.4750	116.4328	112.3384	107.9365	106.2445	109.5458	113.0276	117.6489	122.7688	127.1824	(44)
Energy conte	201.9497	177.7002	186.7026	159.3907	151.2291	132.7205	128.4936	135.6406	139.3744	159.6485	174.9066	199.1369	(45)
Energy content (annual)										Total = Sum(45)m =		1946.8933	
Distribution loss (46)m = 0.15 x (45)m	30.2924	26.6550	28.0054	23.9086	22.6844	19.9081	19.2740	20.3461	20.9062	23.9473	26.2360	29.8705	(46)

Water storage loss (or HIU loss):		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.7527	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5446	219.7859	233.2975	204.4826	197.8240	177.8123	175.0885	182.2355	184.4662	206.2434	219.9985	245.7318	(62)
WWHRS	-28.5727	-25.2700	-26.4612	-21.9110	-20.4202	-17.4737	-16.3788	-17.4172	-18.0790	-21.3131	-24.1452	-28.0436	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9718	194.5160	206.8362	182.5716	177.4038	160.3386	158.7096	164.8183	166.3872	184.9302	195.8533	217.6882	(64)
Total per year (kWh/year) = Sum(64)m =												2230.0249	(64)
12Total per year (kWh/year)												2230	(64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	104.4242	92.7539	99.3545	89.0709	87.5596	80.2030	80.0000	82.3764	82.4154	90.3590	94.2299	103.4889	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.8258	118.2715	106.8258	110.3867	106.8258	110.3867	106.8258	106.8258	110.3867	106.8258	110.3867	106.8258	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8873	202.9719	197.7188	186.5356	172.4188	159.1511	150.2874	148.2028	153.4559	164.6391	178.7558	192.0236	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	(71)
Water heating gains (Table 5)													
	140.3551	138.0266	133.5410	123.7096	117.6876	111.3931	107.5269	110.7210	114.4659	121.4503	130.8749	139.0980	(72)
Total internal gains													
	508.3156	519.5173	498.3330	480.8793	457.1797	438.1783	421.8875	422.9971	435.5559	453.1626	480.2648	498.1949	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	10.8700	19.6403	0.6300	0.7000	0.7700	65.2452	(80)

Solar gains	65.2452	127.6335	210.1942	306.5557	375.6955	384.5912	366.1465	314.5144	244.4645	151.4479	81.3531	53.6545	(83)
Total gains	573.5608	647.1508	708.5272	787.4349	832.8752	822.7695	788.0340	737.5115	680.0204	604.6105	561.6179	551.8494	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.5828	72.7948	73.0038	74.0017	74.1915	75.0877	75.0877	75.2561	74.7400	74.1915	73.8086	73.4126	
alpha	5.8389	5.8530	5.8669	5.9334	5.9461	6.0058	6.0058	6.0171	5.9827	5.9461	5.9206	5.8942	
util living area													
	0.9961	0.9915	0.9783	0.9260	0.7987	0.5964	0.4353	0.4838	0.7453	0.9522	0.9910	0.9969	(86)
MIT	19.9748	20.1354	20.3768	20.6946	20.9057	20.9864	20.9982	20.9968	20.9527	20.6729	20.2754	19.9544	(87)
Th 2	19.9750	19.9777	19.9803	19.9926	19.9950	20.0058	20.0058	20.0078	20.0016	19.9950	19.9903	19.9854	(88)
util rest of house													
	0.9947	0.9882	0.9699	0.8991	0.7386	0.5096	0.3380	0.3813	0.6588	0.9286	0.9871	0.9957	(89)
MIT 2	18.7979	19.0038	19.3091	19.7002	19.9240	19.9993	20.0053	20.0068	19.9743	19.6858	19.1926	18.7797	(90)
Living area fraction									fLA = Living area / (4) =			0.3676	(91)
MIT	19.2305	19.4197	19.7015	20.0657	20.2849	20.3621	20.3703	20.3707	20.3340	20.0486	19.5906	19.2115	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2305	19.4197	19.7015	20.0657	20.2849	20.3621	20.3703	20.3707	20.3340	20.0486	19.5906	19.2115	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9859	0.9671	0.9014	0.7571	0.5414	0.3739	0.4192	0.6893	0.9301	0.9849	0.9945	(94)
Useful gains	569.6616	638.0430	685.2072	709.7814	630.5897	445.4335	294.6091	309.1292	468.7270	562.3649	553.1642	548.7975	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1209.0050	1172.3208	1062.8391	886.8162	680.0915	451.0268	295.1159	310.1101	490.2297	748.5186	994.6382	1201.8241	(97)
Space heating kWh													
	475.6715	359.0347	280.9581	127.4651	36.8293	0.0000	0.0000	0.0000	0.0000	138.4983	317.8613	485.8518	(98a)
Space heating requirement - total per year (kWh/year)												2222.1702	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	475.6715	359.0347	280.9581	127.4651	36.8293	0.0000	0.0000	0.0000	0.0000	138.4983	317.8613	485.8518	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2222.1702	
Space heating per m2											(98c) / (4) =	31.0576	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	475.6715	359.0347	280.9581	127.4651	36.8293	0.0000	0.0000	0.0000	0.0000	138.4983	317.8613	485.8518	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	515.3538	388.9867	304.3967	138.0987	39.9017	0.0000	0.0000	0.0000	0.0000	150.0524	344.3785	526.3833	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9718	194.5160	206.8362	182.5716	177.4038	160.3386	158.7096	164.8183	166.3872	184.9302	195.8533	217.6882	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7422	85.4149	84.7472	83.2697	81.2151	79.8000	79.8000	79.8000	79.8000	83.4205	85.1392	85.8057	(217)
Fuel for water heating, kWh/month													
	256.5504	227.7307	244.0626	219.2533	218.4370	200.9256	198.8842	206.5392	208.5053	221.6844	230.0389	253.6991	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.1963	17.8067	16.0330	11.7464	9.0733	7.4129	8.2769	10.7587	13.9745	18.3353	20.7096	22.8132	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.1717	-28.4022	-42.8739	-50.7029	-56.8669	-53.8840	-53.2318	-49.1692	-42.3797	-33.5738	-21.5614	-16.4190	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.0192	-15.0831	-30.5791	-46.8203	-62.7888	-63.4103	-62.6593	-52.6425	-38.0529	-21.8537	-9.4619	-5.5268	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2407.5517	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2686.3109	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.1368	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-884.1345	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4474.8649	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2407.5517	0.2100	505.5859	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2686.3109	0.2100	564.1253	(264)
Space and water heating			1069.7111	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.1368	0.1443	25.8550	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-468.2366	0.1336	-62.5362	
PV Unit electricity exported	-415.8979	0.1253	-52.1275	
Total			-114.6637	(269)
Total CO2, kg/year			992.8317	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2407.5517	1.1300	2720.5334	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2686.3109	1.1300	3035.5313	(278)
Space and water heating			5756.0647	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.1368	1.5338	274.7661	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-468.2366	1.4935	-699.3324	
PV Unit electricity exported	-415.8979	0.4600	-191.3328	
Total			-890.6652	(283)
Total Primary energy kWh/year			5270.2664	(286)
Target Primary Energy Rate (TPER)			73.6600	(287)

Full SAP Calculation Printout

Plot Reference	P-11	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-11
Plot Address	Flat 6, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.28	**TER**	13.88
Environmental	96 A	**% DER < TER**			61.96
CO_2 Emissions (t/year)	0.3	**DFEE**	38.90	**TFEE**	38.51
Compliance Check	See BREL	**% DFEE < TFEE**			-1.02
% DPER < TPER	26.03	**DPER**	54.48	**TPER**	73.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.5500	(1b)	x 2.5500	(2b) =	182.4525	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	182.4525	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1644 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.9000 (17)
Infiltration rate			0.3094 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2630 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3353	0.3288	0.3222	0.2893	0.2827	0.2499	0.2499	0.2433	0.2630	0.2827	0.2959	0.3090	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5562	0.5540	0.5519	0.5419	0.5400	0.5312	0.5312	0.5296	0.5346	0.5400	0.5438	0.5478	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Exposed Floor			71.5500	0.1275	9.1230	110.0000	7870.5000	(28b)
Brickwork	30.7200	10.8700	19.8500	0.2100	4.1685	110.0000	2183.4999	(29a)
Communal Wall	20.3100	2.1500	18.1600	0.2200	3.9952	110.0000	1997.5999	(29a)
Lift Shaft Wall	10.3900		10.3900	0.2100	2.1819	110.0000	1142.9000	(29a)
Total net area of external elements Aum(A, m2)			132.9700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.4951			(33)
Main dwelling								
Party Wall 1			39.9700	0.0000	0.0000	110.0000	4396.7001	(32)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21158.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							295.7205	(35)
List of Thermal Bridges								

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	20.9900	0.0380	0.7976	
E18 Party wall between dwellings	11.7000	0.0380	0.4446	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6600	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547	
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775	
E4 Jamb	18.6000	0.0160	0.2976	
E20 Exposed floor (normal)	18.4000	0.1200	2.2080	
P7 Party Wall - Exposed floor (normal)	13.6600	0.4800	6.5568	
E16 Corner (normal)	8.5500	0.0540	0.4617	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7104 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.2055 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.4900	33.3586	33.2297	32.6245	32.5113	31.9841	31.9841	31.8865	32.1872	32.5113	32.7403	32.9798	(38)
Heat transfer coeff	79.6956	79.5641	79.4353	78.8300	78.7168	78.1897	78.1897	78.0920	78.3927	78.7168	78.9459	79.1854	(39)

Average = Sum(39)m / 12 = 78.8295

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1138	1.1120	1.1102	1.1017	1.1002	1.0928	1.0928	1.0914	1.0956	1.1002	1.1034	1.1067	(40)
HLP (average)												1.1017	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2832 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.0006	26.5996	26.0349	24.9937	24.2141	23.3496	22.8827	23.4434	24.0539	24.9790	26.0416	26.9093	(42b)

Hot water usage for other uses

38.0118	36.6296	35.2473	33.8651	32.4828	31.1006	31.1006	32.4828	33.8651	35.2473	36.6296	38.0118	(42c)

Average daily hot water use (litres/day) 59.5900 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.0124	63.2292	61.2822	58.8588	56.6969	54.4502	53.9833	55.9262	57.9190	60.2263	62.6712	64.9211	(44)
Energy conte	102.9638	90.0375	94.1885	80.5748	76.3250	66.9529	65.2881	69.2484	71.4200	81.7265	89.2866	101.6508	(45)

Energy content (annual) Total = Sum(45)m = 989.6628

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

87.5192	76.5319	80.0602	68.4886	64.8762	56.9100	55.4949	58.8611	60.7070	69.4675	75.8936	86.4032	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

87.5192	76.5319	80.0602	68.4886	64.8762	56.9100	55.4949	58.8611	60.7070	69.4675	75.8936	86.4032	(64)

Total per year (kWh/year) = Sum(64)m = 841.2134 (64)

12Total per year (kWh/year) 841 (64)

Electric shower(s)

50.0527	44.5973	48.6986	46.4725	47.3445	45.1621	46.6675	47.3445	46.4725	48.6986	47.7829	50.0527	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 569.3462 (64a)

Heat gains from water heating, kWh/month

34.3930	30.2823	32.1897	28.7403	28.0552	25.5180	25.5406	26.5514	26.7949	29.5415	30.9191	34.1140	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.8258	118.2715	106.8258	110.3867	106.8258	110.3867	106.8258	106.8258	110.3867	106.8258	110.3867	106.8258	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8873	202.9719	197.7188	186.5356	172.4188	159.1511	150.2874	148.2028	153.4559	164.6391	178.7558	192.0236	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	(71)
Water heating gains (Table 5)	46.2271	45.0630	43.2657	39.9170	37.7086	35.4417	34.3287	35.6874	37.2151	39.7064	42.9432	45.8521	(72)
Total internal gains	411.1876	423.5537	405.0577	394.0867	374.2006	362.2268	348.6894	347.9634	358.3051	368.4187	389.3331	401.9489	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
West	5.4500	19.6403	0.3300	0.0000	0.7700	27.1987	(80)

Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107	(83)
Total gains	465.4353	529.6737	579.8224	648.9705	686.5703	681.9927	653.1195	609.4644	561.5636	494.3391	456.9737	446.5596	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.7487	73.8705	73.9904	74.5584	74.6657	75.1691	75.1691	75.2630	74.9744	74.6657	74.4490	74.2239	
alpha	5.9166	5.9247	5.9327	5.9706	5.9777	6.0113	6.0113	6.0175	5.9983	5.9777	5.9633	5.9483	
util living area	0.9987	0.9969	0.9915	0.9656	0.8827	0.6995	0.5214	0.5791	0.8406	0.9800	0.9968	0.9990	(86)
MIT	19.8598	20.0084	20.2400	20.5684	20.8337	20.9691	20.9954	20.9917	20.9090	20.5590	20.1536	19.8346	(87)
Th 2	19.9895	19.9910	19.9925	19.9994	20.0007	20.0067	20.0067	20.0078	20.0044	20.0007	19.9981	19.9954	(88)
util rest of house	0.9982	0.9956	0.9878	0.9504	0.8346	0.6061	0.4067	0.4599	0.7630	0.9683	0.9953	0.9986	(89)
MIT 2	18.9550	19.1043	19.3352	19.6589	19.8947	19.9943	20.0058	20.0059	19.9590	19.6559	19.2551	18.9346	(90)
Living area fraction										fLA = Living area / (4) =		0.3676	(91)
MIT	19.2876	19.4366	19.6678	19.9932	20.2398	20.3526	20.3695	20.3683	20.3082	19.9879	19.5854	19.2654	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2876	19.4366	19.6678	19.9932	20.2398	20.3526	20.3695	20.3683	20.3082	19.9879	19.5854	19.2654	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9947	0.9863	0.9503	0.8475	0.6401	0.4492	0.5042	0.7892	0.9681	0.9945	0.9982	(94)
Useful gains	464.3579	526.8521	571.8882	616.7349	581.8593	436.5339	293.3792	307.2653	443.2065	478.5901	454.4580	445.7500	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1194.4432	1156.5920	1045.9837	874.4761	672.2270	449.7952	294.7381	309.8892	486.6767	738.9840	985.6679	1192.9575	(97)
Space heating kWh	543.1834	423.1852	352.7270	185.5737	67.2336	0.0000	0.0000	0.0000	0.0000	193.7331	382.4711	555.9224	(98a)
Space heating requirement - total per year (kWh/year)												2704.0295	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	543.1834	423.1852	352.7270	185.5737	67.2336	0.0000	0.0000	0.0000	0.0000	193.7331	382.4711	555.9224	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2704.0295	
Space heating per m2											(98c) / (4) =	37.7922	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	734.9828	578.6035	593.4995	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8674	0.9331	0.9051	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	637.5178	539.9196	537.1578	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	752.7251	721.2107	672.3093	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	82.9492	134.8806	100.5527	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	20.7373	33.7201	25.1382	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												79.5956	(107)
Energy for space heating												37.7922	(99)
Energy for space cooling												1.1124	(108)
Total												38.9046	(109)
Fabric Energy Efficiency (DFEE)												38.9	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		71.5500 (1b)	x	2.5500 (2b)	=	182.4525	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4525	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1644	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4144	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3523	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4491	0.4403	0.4315	0.3875	0.3787	0.3346	0.3346	0.3258	0.3523	0.3787	0.3963	0.4139	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.6009	0.5969	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5620	0.5717	0.5785	0.5857	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
Exposed Floor			71.5500	0.1300	9.3015			(28b)
Brickwork	30.7200	10.8700	19.8500	0.1800	3.5730			(29a)
Communal Wall	20.3100	2.1500	18.1600	0.1800	3.2688			(29a)
Lift Shaft Wall	10.3900		10.3900	0.1800	1.8702			(29a)
Total net area of external elements Aum(A, m2)			132.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.6101			(33)
Main dwelling								
Party Wall 1			39.9700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	295.7205	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	20.9900	0.0700	1.4693
E18 Party wall between dwellings	11.7000	0.0600	0.7020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.0200	0.0518
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0500	0.9300
E20 Exposed floor (normal)	18.4000	0.3200	5.8880
P7 Party Wall - Exposed floor (normal)	13.6600	0.1600	2.1856
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.1882	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.7983	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1774	35.9416	35.7105	34.6248	34.4217	33.4761	33.4761	33.3010	33.8403	34.4217	34.8326	35.2622	(38)
Heat transfer coeff	80.9757	80.7399	80.5087	79.4231	79.2199	78.2744	78.2744	78.0992	78.6386	79.2199	79.6309	80.0605	(39)
Average = Sum(39)m / 12 =												79.4221	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1317	1.1284	1.1252	1.1100	1.1072	1.0940	1.0940	1.0915	1.0991	1.1072	1.1129	1.1189	(40)
HLP (average)												1.1100	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2832	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.0006	26.5996	26.0349	24.9937	24.2141	23.3496	22.8827	23.4434	24.0539	24.9790	26.0416	26.9093	(42b)

Hot water usage for other uses

38.0118	36.6296	35.2473	33.8651	32.4828	31.1006	31.1006	32.4828	33.8651	35.2473	36.6296	38.0118	(42c)

Average daily hot water use (litres/day)	59.5900	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0124	63.2292	61.2822	58.8588	56.6969	54.4502	53.9833	55.9262	57.9190	60.2263	62.6712	64.9211	(44)
Energy conte	102.9638	90.0375	94.1885	80.5748	76.3250	66.9529	65.2881	69.2484	71.4200	81.7265	89.2866	101.6508	(45)
Energy content (annual)										Total = Sum(45)m =		989.6628	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5192	76.5319	80.0602	68.4886	64.8762	56.9100	55.4949	58.8611	60.7070	69.4675	75.8936	86.4032	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5192	76.5319	80.0602	68.4886	64.8762	56.9100	55.4949	58.8611	60.7070	69.4675	75.8936	86.4032	(64)
										Total per year (kWh/year) = Sum(64)m =		841.2134	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0527	44.5973	48.6986	46.4725	47.3445	45.1621	46.6675	47.3445	46.4725	48.6986	47.7829	50.0527	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.3462	(64a)

Heat gains from water heating, kWh/month

	34.3930	30.2823	32.1897	28.7403	28.0552	25.5180	25.5406	26.5514	26.7949	29.5415	30.9191	34.1140 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	106.8258	118.2715	106.8258	110.3867	106.8258	110.3867	106.8258	106.8258	110.3867	106.8258	110.3867	106.8258	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8873	202.9719	197.7188	186.5356	172.4188	159.1511	150.2874	148.2028	153.4559	164.6391	178.7558	192.0236	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	(71)

Water heating gains (Table 5)

	46.2271	45.0630	43.2657	39.9170	37.7086	35.4417	34.3287	35.6874	37.2151	39.7064	42.9432	45.8521	(72)

Total internal gains

	411.1876	423.5537	405.0577	394.0867	374.2006	362.2268	348.6894	347.9634	358.3051	368.4187	389.3331	401.9489	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	10.8700	19.6403	0.6300	0.7000	0.7700	65.2452	(80)

Solar gains	65.2452	127.6335	210.1942	306.5557	375.6955	384.5912	366.1465	314.5144	244.4645	151.4479	81.3531	53.6545	(83)
Total gains	476.4328	551.1871	615.2519	700.6424	749.8961	746.8180	714.8358	662.4778	602.7696	519.8666	470.6863	455.6034	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.5828	72.7948	73.0038	74.0017	74.1915	75.0877	75.0877	75.2561	74.7400	74.1915	73.8086	73.4126	
alpha	5.8389	5.8530	5.8669	5.9334	5.9461	6.0058	6.0058	6.0171	5.9827	5.9461	5.9206	5.8942	
util living area	0.9985	0.9962	0.9888	0.9532	0.8484	0.6494	0.4787	0.5360	0.8081	0.9751	0.9964	0.9989	(86)
MIT	19.8493	20.0138	20.2654	20.6138	20.8675	20.9789	20.9970	20.9945	20.9267	20.5823	20.1601	19.8293	(87)
Th 2	19.9750	19.9777	19.9803	19.9926	19.9950	20.0058	20.0058	20.0078	20.0016	19.9950	19.9903	19.9854	(88)
util rest of house	0.9980	0.9947	0.9842	0.9339	0.7940	0.5583	0.3723	0.4239	0.7257	0.9611	0.9946	0.9984	(89)
MIT 2	18.9329	19.0988	19.3498	19.6940	19.9136	19.9976	20.0052	20.0065	19.9664	19.6725	19.2551	18.9213	(90)
Living area fraction										fLA = Living area / (4) =		0.3676	(91)
MIT	19.2697	19.4351	19.6864	20.0321	20.2642	20.3583	20.3698	20.3696	20.3194	20.0069	19.5878	19.2551	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2697	19.4351	19.6864	20.0321	20.2642	20.3583	20.3698	20.3696	20.3194	20.0069	19.5878	19.2551	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9974	0.9936	0.9825	0.9348	0.8099	0.5917	0.4116	0.4654	0.7543	0.9613	0.9937	0.9980	(94)
Useful gains	475.1916	547.6610	604.4577	654.9643	607.3378	441.8598	294.2205	308.3080	454.6702	499.7433	467.7110	454.6861	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1212.1828	1173.5657	1061.6169	884.1475	678.4558	450.7285	295.0750	310.0266	489.0870	745.2168	994.4112	1205.3167	(97)
Space heating kWh	548.3214	420.6079	340.1264	165.0119	52.9117	0.0000	0.0000	0.0000	0.0000	182.6323	379.2241	558.4692	(98a)
Space heating requirement - total per year (kWh/year)												2647.3051	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	548.3214	420.6079	340.1264	165.0119	52.9117	0.0000	0.0000	0.0000	0.0000	182.6323	379.2241	558.4692	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2647.3051	
Space heating per m2											(98c) / (4) =	36.9994	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	735.7789	579.2302	593.5543	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9028	0.9541	0.9313	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	664.2759	552.6617	552.7659	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	828.4949	793.3466	734.2730	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	118.2377	179.0696	135.0413	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.5594	44.7674	33.7603	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												108.0871	(107)
Energy for space heating												36.9994	(99)
Energy for space cooling												1.5107	(108)
Total												38.5100	(109)
Fabric Energy Efficiency (TFEE)												38.5	(109)

Full SAP Calculation Printout

Plot Reference	P-11	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-11
Plot Address	Flat 6, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.28	**TER**	13.88
Environmental	96 A	**% DER < TER**			61.96
CO_2 Emissions (t/year)	0.3	**DFEE**	38.90	**TFEE**	38.51
Compliance Check	See BREL	**% DFEE < TFEE**			-1.02
% DPER < TPER	26.03	**DPER**	54.48	**TPER**	73.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.5500 (1b)	x	2.5500 (2b)	=	182.4525	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4525	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9000	(17)
Infiltration rate		0.1450	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1232	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1571	0.1541	0.1510	0.1356	0.1325	0.1171	0.1171	0.1140	0.1232	0.1325	0.1387	0.1448	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2931	0.2901	0.2870	0.2716	0.2685	0.2531	0.2531	0.2500	0.2592	0.2685	0.2747	0.2808	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Exposed Floor			71.5500	0.1275	9.1230	110.0000	7870.5000	(28b)
Brickwork	30.7200	10.8700	19.8500	0.2100	4.1685	110.0000	2183.4999	(29a)
Communal Wall	20.3100	2.1500	18.1600	0.2200	3.9952	110.0000	1997.5999	(29a)
Lift Shaft Wall	10.3900		10.3900	0.2100	2.1819	110.0000	1142.9000	(29a)
Total net area of external elements Aum(A, m2)			132.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.4951			(33)
Main dwelling								
Party Wall 1			39.9700	0.0000	0.0000	110.0000	4396.7001	(32)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	21158.8000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 295.7205 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	20.9900	0.0380	0.7976
E18	Party wall between dwellings	11.7000	0.0380	0.4446
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6600	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2	Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4	Jamb	18.6000	0.0160	0.2976
E20	Exposed floor (normal)	18.4000	0.1200	2.2080
P7	Party Wall - Exposed floor (normal)	13.6600	0.4800	6.5568
E16	Corner (normal)	8.5500	0.0540	0.4617
E17	Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E25	Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7104 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.2055 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.6500	17.4645	17.2789	16.3513	16.1658	15.2382	15.2382	15.0527	15.6093	16.1658	16.5369	16.9079	(38)
Heat transfer coeff	63.8555	63.6700	63.4845	62.5569	62.3714	61.4438	61.4438	61.2582	61.8148	62.3714	62.7424	63.1134	(39)

Average = Sum(39)m / 12 = 62.5105

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8925	0.8899	0.8873	0.8743	0.8717	0.8588	0.8588	0.8562	0.8639	0.8717	0.8769	0.8821	(40)
HLP (average)												0.8737	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2832 (42)
Hot water usage for mixer showers

62.5007	61.5615	60.1928	57.5740	55.6415	53.4863	52.2613	53.6196	55.1086	57.4226	60.0976	62.2613	(42a)

Hot water usage for baths

27.0006	26.5996	26.0349	24.9937	24.2141	23.3496	22.8827	23.4434	24.0539	24.9790	26.0416	26.9093	(42b)

Hot water usage for other uses

38.0118	36.6296	35.2473	33.8651	32.4828	31.1006	31.1006	32.4828	33.8651	35.2473	36.6296	38.0118	(42c)

Average daily hot water use (litres/day) 117.2136 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5132	124.7906	121.4750	116.4328	112.3384	107.9365	106.2445	109.5458	113.0276	117.6489	122.7688	127.1824	(44)
Energy conte	201.9497	177.7002	186.7026	159.3907	151.2291	132.7205	128.4936	135.6406	139.3744	159.6485	174.9066	199.1369	(45)

Energy content (annual) Total = Sum(45)m = 1946.8933

Distribution loss (46)m = 0.15 x (45)m	30.2924	26.6550	28.0054	23.9086	22.6844	19.9081	19.2740	20.3461	20.9062	23.9473	26.2360	29.8705	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)

Total per year (kWh/year) = Sum(64)m = 2291.8183 (64)
12Total per year (kWh/year) 2292 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

67.1483	59.0853	62.0786	52.9974	50.2837	44.1296	42.7241	45.1005	46.3420	53.0831	58.1565	66.2130	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.8258	118.2715	106.8258	110.3867	106.8258	110.3867	106.8258	106.8258	110.3867	106.8258	110.3867	106.8258	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8873	202.9719	197.7188	186.5356	172.4188	159.1511	150.2874	148.2028	153.4559	164.6391	178.7558	192.0236	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	(71)
Water heating gains (Table 5)	90.2530	87.9246	83.4390	73.6075	67.5856	61.2911	57.4249	60.6190	64.3639	71.3483	80.7729	88.9960	(72)
Total internal gains	455.2135	466.4153	445.2310	427.7772	404.0776	388.0762	371.7855	372.8950	385.4538	400.0606	427.1628	445.0928	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)

West				5.4500		19.6403		0.3300		0.0000		0.7700	27.1987 (80)
Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107 (83)	
Total gains	509.4613	572.5354	619.9956	682.6610	716.4473	707.8421	676.2157	634.3960	588.7123	525.9810	494.8033	489.7035 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	92.0429	92.3110	92.5808	93.9536	94.2331	95.6557	95.6557	95.9454	95.0815	94.2331	93.6758	93.1251	
alpha	7.1362	7.1541	7.1721	7.2636	7.2822	7.3770	7.3770	7.3964	7.3388	7.2822	7.2451	7.2083	
util living area	0.9973	0.9931	0.9800	0.9193	0.7695	0.5523	0.3995	0.4436	0.7044	0.9501	0.9928	0.9979	(86)
MIT	20.2380	20.3766	20.5725	20.8229	20.9607	20.9968	20.9997	20.9995	20.9838	20.7960	20.4788	20.2185	(87)
Th 2	20.1739	20.1761	20.1783	20.1894	20.1916	20.2027	20.2027	20.2049	20.1983	20.1916	20.1872	20.1828	(88)
util rest of house	0.9963	0.9906	0.9727	0.8934	0.7160	0.4851	0.3273	0.3673	0.6314	0.9279	0.9897	0.9972	(89)
MIT 2	19.2876	19.4656	19.7133	20.0201	20.1623	20.2012	20.2026	20.2048	20.1890	19.9979	19.6052	19.2697	(90)
Living area fraction										fLA = Living area / (4) =		0.3676	(91)
MIT	19.6369	19.8005	20.0292	20.3152	20.4558	20.4936	20.4956	20.4969	20.4811	20.2913	19.9263	19.6185	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6369	19.8005	20.0292	20.3152	20.4558	20.4936	20.4956	20.4969	20.4811	20.2913	19.9263	19.6185	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9891	0.9711	0.8978	0.7342	0.5098	0.3539	0.3953	0.6579	0.9310	0.9884	0.9965	(94)
Useful gains	507.1446	566.3115	602.0963	612.9084	526.0069	360.8627	239.2894	250.8083	387.3052	489.7135	489.0803	487.9741	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	979.3480	948.7152	858.8912	714.0982	546.1094	362.1273	239.3622	250.9676	394.4477	604.4589	804.7552	973.1121	(97)
Space heating kWh	351.3194	256.9753	191.0554	72.8567	14.9562	0.0000	0.0000	0.0000	0.0000	85.3706	227.2860	360.9427	(98a)
Space heating requirement - total per year (kWh/year)												1560.7622	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.3194	256.9753	191.0554	72.8567	14.9562	0.0000	0.0000	0.0000	0.0000	85.3706	227.2860	360.9427	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1560.7622	
Space heating per m2										(98c) / (4) =		21.8136	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	351.3194	256.9753	191.0554	72.8567	14.9562	0.0000	0.0000	0.0000	0.0000	85.3706	227.2860	360.9427	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	351.3194	256.9753	191.0554	72.8567	14.9562	0.0000	0.0000	0.0000	0.0000	85.3706	227.2860	360.9427	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	63.9389	56.4501	59.7231	51.9101	49.9147	44.5358	43.6284	45.6045	46.3756	52.2427	56.2002	63.1612	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.1067	10.0319	11.1067	10.7485	11.1067	10.7485	11.1067	11.1067	10.7485	11.1067	10.7485	11.1067	(231)
Lighting	21.7426	17.4427	15.7052	11.5063	8.8878	7.2614	8.1078	10.5388	13.6888	17.9605	20.2864	22.3469	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1560.7622	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	361.6650	
Water heating fuel used	633.6854	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	130.7728	(230a)
Total electricity for the above, kWh/year	130.7728	(231)
Electricity for lighting (calculated in Appendix L)	175.4754	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2500.6958	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1560.7622	0.1568	244.7695	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.6854	0.1411	89.4427	(264)
Space and water heating			334.2122	(265)
Pumps, fans and electric keep-hot	130.7728	0.1387	18.1398	(267)
Energy for lighting	175.4754	0.1443	25.3265	(268)
Total CO2, kg/year			377.6785	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1560.7622	1.5806	2466.9217	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.6854	1.5219	964.4198	(278)
Space and water heating			3431.3415	(279)
Pumps, fans and electric keep-hot	130.7728	1.5128	197.8331	(281)
Energy for lighting	175.4754	1.5338	269.1500	(282)
Total Primary energy kWh/year			3898.3246	(286)
Dwelling Primary energy Rate (DPER)			54.4800	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.5500	(1b)	x 2.5500	(2b) =	182.4525	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		182.4525	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1644	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4144	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3523	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4491	0.4403	0.4315	0.3875	0.3787	0.3346	0.3346	0.3258	0.3523	0.3787	0.3963	0.4139	(22b)

Effective ac	0.6009	0.5969	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5620	0.5717	0.5785	0.5857 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
Exposed Floor			71.5500	0.1300	9.3015			(28b)
Brickwork	30.7200	10.8700	19.8500	0.1800	3.5730			(29a)
Communal Wall	20.3100	2.1500	18.1600	0.1800	3.2688			(29a)
Lift Shaft Wall	10.3900		10.3900	0.1800	1.8702			(29a)
Total net area of external elements Aum(A, m2)			132.9700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.6101			(33)
Main dwelling								
Party Wall 1			39.9700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	295.7205	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	20.9900	0.0700	1.4693
E18 Party wall between dwellings	11.7000	0.0600	0.7020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.0200	0.0518
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0500	0.9300
E20 Exposed floor (normal)	18.4000	0.3200	5.8880
P7 Party Wall - Exposed floor (normal)	13.6600	0.1600	2.1856
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.1882	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.7983	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1774	35.9416	35.7105	34.6248	34.4217	33.4761	33.4761	33.3010	33.8403	34.4217	34.8326	35.2622	(38)
Heat transfer coeff	80.9757	80.7399	80.5087	79.4231	79.2199	78.2744	78.2744	78.0992	78.6386	79.2199	79.6309	80.0605	(39)
Average = Sum(39)m / 12 =												79.4221	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1317	1.1284	1.1252	1.1100	1.1072	1.0940	1.0940	1.0915	1.0991	1.1072	1.1129	1.1189	(40)
HLP (average)												1.1100	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2832	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.5007	61.5615	60.1928	57.5740	55.6415	53.4863	52.2613	53.6196	55.1086	57.4226	60.0976	62.2613	(42a)
Hot water usage for baths	27.0006	26.5996	26.0349	24.9937	24.2141	23.3496	22.8827	23.4434	24.0539	24.9790	26.0416	26.9093	(42b)
Hot water usage for other uses	38.0118	36.6296	35.2473	33.8651	32.4828	31.1006	31.1006	32.4828	33.8651	35.2473	36.6296	38.0118	(42c)
Average daily hot water use (litres/day)												117.2136	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5132	124.7906	121.4750	116.4328	112.3384	107.9365	106.2445	109.5458	113.0276	117.6489	122.7688	127.1824	(44)
Energy conte	201.9497	177.7002	186.7026	159.3907	151.2291	132.7205	128.4936	135.6406	139.3744	159.6485	174.9066	199.1369	(45)
Energy content (annual)										Total = Sum(45)m =		1946.8933	
Distribution loss (46)m = 0.15 x (45)m	30.2924	26.6550	28.0054	23.9086	22.6844	19.9081	19.2740	20.3461	20.9062	23.9473	26.2360	29.8705	(46)

Water storage loss (or HIU loss):		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.7527	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5446	219.7859	233.2975	204.4826	197.8240	177.8123	175.0885	182.2355	184.4662	206.2434	219.9985	245.7318	(62)
WWHRS	-28.5727	-25.2700	-26.4612	-21.9110	-20.4202	-17.4737	-16.3788	-17.4172	-18.0790	-21.3131	-24.1452	-28.0436	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9718	194.5160	206.8362	182.5716	177.4038	160.3386	158.7096	164.8183	166.3872	184.9302	195.8533	217.6882	(64)
Total per year (kWh/year) = Sum(64)m =												2230.0249	(64)
12Total per year (kWh/year)												2230	(64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	104.4242	92.7539	99.3545	89.0709	87.5596	80.2030	80.0000	82.3764	82.4154	90.3590	94.2299	103.4889	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	114.1580	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.8258	118.2715	106.8258	110.3867	106.8258	110.3867	106.8258	106.8258	110.3867	106.8258	110.3867	106.8258	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8873	202.9719	197.7188	186.5356	172.4188	159.1511	150.2874	148.2028	153.4559	164.6391	178.7558	192.0236	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	34.4158	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	(71)
Water heating gains (Table 5)													
	140.3551	138.0266	133.5410	123.7096	117.6876	111.3931	107.5269	110.7210	114.4659	121.4503	130.8749	139.0980	(72)
Total internal gains													
	508.3156	519.5173	498.3330	480.8793	457.1797	438.1783	421.8875	422.9971	435.5559	453.1626	480.2648	498.1949	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	10.8700	19.6403	0.6300	0.7000	0.7700	65.2452	(80)

Solar gains	65.2452	127.6335	210.1942	306.5557	375.6955	384.5912	366.1465	314.5144	244.4645	151.4479	81.3531	53.6545	(83)
Total gains	573.5608	647.1508	708.5272	787.4349	832.8752	822.7695	788.0340	737.5115	680.0204	604.6105	561.6179	551.8494	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.5828	72.7948	73.0038	74.0017	74.1915	75.0877	75.0877	75.2561	74.7400	74.1915	73.8086	73.4126	
alpha	5.8389	5.8530	5.8669	5.9334	5.9461	6.0058	6.0058	6.0171	5.9827	5.9461	5.9206	5.8942	
util living area													
	0.9961	0.9915	0.9783	0.9260	0.7987	0.5964	0.4353	0.4838	0.7453	0.9522	0.9910	0.9969	(86)
MIT	19.9748	20.1354	20.3768	20.6946	20.9057	20.9864	20.9982	20.9968	20.9527	20.6729	20.2754	19.9544	(87)
Th 2	19.9750	19.9777	19.9803	19.9926	19.9950	20.0058	20.0058	20.0078	20.0016	19.9950	19.9903	19.9854	(88)
util rest of house													
	0.9947	0.9882	0.9699	0.8991	0.7386	0.5096	0.3380	0.3813	0.6588	0.9286	0.9871	0.9957	(89)
MIT 2	18.7979	19.0038	19.3091	19.7002	19.9240	19.9993	20.0053	20.0068	19.9743	19.6858	19.1926	18.7797	(90)
Living area fraction									fLA = Living area / (4) =			0.3676	(91)
MIT	19.2305	19.4197	19.7015	20.0657	20.2849	20.3621	20.3703	20.3707	20.3340	20.0486	19.5906	19.2115	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2305	19.4197	19.7015	20.0657	20.2849	20.3621	20.3703	20.3707	20.3340	20.0486	19.5906	19.2115	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9859	0.9671	0.9014	0.7571	0.5414	0.3739	0.4192	0.6893	0.9301	0.9849	0.9945	(94)
Useful gains	569.6616	638.0430	685.2072	709.7814	630.5897	445.4335	294.6091	309.1292	468.7270	562.3649	553.1642	548.7975	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1209.0050	1172.3208	1062.8391	886.8162	680.0915	451.0268	295.1159	310.1101	490.2297	748.5186	994.6382	1201.8241	(97)
Space heating kWh													
	475.6715	359.0347	280.9581	127.4651	36.8293	0.0000	0.0000	0.0000	0.0000	138.4983	317.8613	485.8518	(98a)
Space heating requirement - total per year (kWh/year)												2222.1702	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	475.6715	359.0347	280.9581	127.4651	36.8293	0.0000	0.0000	0.0000	0.0000	138.4983	317.8613	485.8518	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2222.1702	
Space heating per m2											(98c) / (4) =	31.0576	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	475.6715	359.0347	280.9581	127.4651	36.8293	0.0000	0.0000	0.0000	0.0000	138.4983	317.8613	485.8518	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	515.3538	388.9867	304.3967	138.0987	39.9017	0.0000	0.0000	0.0000	0.0000	150.0524	344.3785	526.3833	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9718	194.5160	206.8362	182.5716	177.4038	160.3386	158.7096	164.8183	166.3872	184.9302	195.8533	217.6882	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7422	85.4149	84.7472	83.2697	81.2151	79.8000	79.8000	79.8000	79.8000	83.4205	85.1392	85.8057	(217)
Fuel for water heating, kWh/month													
	256.5504	227.7307	244.0626	219.2533	218.4370	200.9256	198.8842	206.5392	208.5053	221.6844	230.0389	253.6991	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.1963	17.8067	16.0330	11.7464	9.0733	7.4129	8.2769	10.7587	13.9745	18.3353	20.7096	22.8132	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.1717	-28.4022	-42.8739	-50.7029	-56.8669	-53.8840	-53.2318	-49.1692	-42.3797	-33.5738	-21.5614	-16.4190	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.0192	-15.0831	-30.5791	-46.8203	-62.7888	-63.4103	-62.6593	-52.6425	-38.0529	-21.8537	-9.4619	-5.5268	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2407.5517	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2686.3109	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.1368	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-884.1345	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4474.8649	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2407.5517	0.2100	505.5859	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2686.3109	0.2100	564.1253	(264)
Space and water heating			1069.7111	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.1368	0.1443	25.8550	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-468.2366	0.1336	-62.5362	
PV Unit electricity exported	-415.8979	0.1253	-52.1275	
Total			-114.6637	(269)
Total CO2, kg/year			992.8317	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2407.5517	1.1300	2720.5334	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2686.3109	1.1300	3035.5313	(278)
Space and water heating			5756.0647	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.1368	1.5338	274.7661	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-468.2366	1.4935	-699.3324	
PV Unit electricity exported	-415.8979	0.4600	-191.3328	
Total			-890.6652	(283)
Total Primary energy kWh/year			5270.2664	(286)
Target Primary Energy Rate (TPER)			73.6600	(287)

Full SAP Calculation Printout

Plot Reference	P-11	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-11
Plot Address	Flat 6, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.28	**TER**	13.88
Environmental	96 A	**% DER < TER**			61.96
CO_2 Emissions (t/year)	0.3	**DFEE**	38.90	**TFEE**	38.51
Compliance Check	See BREL	**% DFEE < TFEE**			-1.02
% DPER < TPER	26.03	**DPER**	54.48	**TPER**	73.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.5500 (1b)	x	2.5500 (2b)	=	182.4525	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4525	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9000	(17)
Infiltration rate		0.1450	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1232	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1571	0.1541	0.1510	0.1356	0.1325	0.1171	0.1171	0.1140	0.1232	0.1325	0.1387	0.1448	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2931	0.2901	0.2870	0.2716	0.2685	0.2531	0.2531	0.2500	0.2592	0.2685	0.2747	0.2808	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Exposed Floor			71.5500	0.1275	9.1230	110.0000	7870.5000	(28b)
Brickwork	30.7200	10.8700	19.8500	0.2100	4.1685	110.0000	2183.4999	(29a)
Communal Wall	20.3100	2.1500	18.1600	0.2200	3.9952	110.0000	1997.5999	(29a)
Lift Shaft Wall	10.3900		10.3900	0.2100	2.1819	110.0000	1142.9000	(29a)
Total net area of external elements Aum(A, m2)			132.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.4951			(33)
Main dwelling								
Party Wall 1			39.9700	0.0000	0.0000	110.0000	4396.7001	(32)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21158.8000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 295.7205 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	20.9900	0.0380	0.7976
E18	Party wall between dwellings	11.7000	0.0380	0.4446
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6600	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2	Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4	Jamb	18.6000	0.0160	0.2976
E20	Exposed floor (normal)	18.4000	0.1200	2.2080
P7	Party Wall - Exposed floor (normal)	13.6600	0.4800	6.5568
E16	Corner (normal)	8.5500	0.0540	0.4617
E17	Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E25	Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7104 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 46.2055 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.6500	17.4645	17.2789	16.3513	16.1658	15.2382	15.2382	15.0527	15.6093	16.1658	16.5369	16.9079	(38)
Heat transfer coeff	63.8555	63.6700	63.4845	62.5569	62.3714	61.4438	61.4438	61.2582	61.8148	62.3714	62.7424	63.1134	(39)

Average = Sum(39)m / 12 = 62.5105

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8925	0.8899	0.8873	0.8743	0.8717	0.8588	0.8588	0.8562	0.8639	0.8717	0.8769	0.8821	(40)
HLP (average)												0.8737	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2832 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.5007	61.5615	60.1928	57.5740	55.6415	53.4863	52.2613	53.6196	55.1086	57.4226	60.0976	62.2613	(42a)
Hot water usage for baths	27.0006	26.5996	26.0349	24.9937	24.2141	23.3496	22.8827	23.4434	24.0539	24.9790	26.0416	26.9093	(42b)
Hot water usage for other uses	38.0118	36.6296	35.2473	33.8651	32.4828	31.1006	31.1006	32.4828	33.8651	35.2473	36.6296	38.0118	(42c)

Average daily hot water use (litres/day) 117.2136 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5132	124.7906	121.4750	116.4328	112.3384	107.9365	106.2445	109.5458	113.0276	117.6489	122.7688	127.1824	(44)
Energy conte	201.9497	177.7002	186.7026	159.3907	151.2291	132.7205	128.4936	135.6406	139.3744	159.6485	174.9066	199.1369	(45)

Energy content (annual) Total = Sum(45)m = 1946.8933

Distribution loss (46)m = 0.15 x (45)m	30.2924	26.6550	28.0054	23.9086	22.6844	19.9081	19.2740	20.3461	20.9062	23.9473	26.2360	29.8705	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)

Total per year (kWh/year) = Sum(64)m = 2291.8183 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	67.1483	59.0853	62.0786	52.9974	50.2837	44.1296	42.7241	45.1005	46.3420	53.0831	58.1565	66.2130	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.8404	22.0630	17.9428	13.5839	10.1541	8.5725	9.2629	12.0403	16.1604	20.5194	23.9492	25.5307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.8318	302.9431	295.1027	278.4114	257.3416	237.5389	224.3096	221.1982	229.0387	245.7300	266.7998	286.6024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	(71)
Water heating gains (Table 5)	90.2530	87.9246	83.4390	73.6075	67.5856	61.2911	57.4249	60.6190	64.3639	71.3483	80.7729	88.9960	(72)
Total internal gains	511.5705	509.5760	493.1298	462.2481	431.7265	404.0478	387.6427	390.5028	406.2083	434.2429	468.1671	497.7744	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
West	5.4500	19.6403	0.3300	0.0000	0.7700	27.1987	(80)

Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107	(83)
Total gains	565.8182	615.6960	667.8944	717.1318	744.0962	723.8137	692.0728	652.0038	609.4667	560.1633	535.8076	542.3851	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	92.0429	92.3110	92.5808	93.9536	94.2331	95.6557	95.6557	95.9454	95.0815	94.2331	93.6758	93.1251	
alpha	7.1362	7.1541	7.1721	7.2636	7.2822	7.3770	7.3770	7.3964	7.3388	7.2822	7.2451	7.2083	
util living area	0.9949	0.9894	0.9704	0.9014	0.7474	0.5405	0.3904	0.4317	0.6837	0.9333	0.9885	0.9961	(86)
MIT	20.3128	20.4321	20.6278	20.8487	20.9673	20.9972	20.9998	20.9996	20.9865	20.8276	20.5313	20.2890	(87)
Th 2	20.1739	20.1761	20.1783	20.1894	20.1916	20.2027	20.2027	20.2049	20.1983	20.1916	20.1872	20.1828	(88)
util rest of house	0.9930	0.9857	0.9602	0.8721	0.6934	0.4746	0.3198	0.3574	0.6114	0.9061	0.9838	0.9947	(89)
MIT 2	19.3827	19.5353	19.7803	20.0475	20.1676	20.2014	20.2026	20.2048	20.1907	20.0323	19.6709	19.3595	(90)
Living area fraction									fLA = Living area / (4) =			0.3676	(91)
MIT	19.7246	19.8649	20.0919	20.3420	20.4615	20.4939	20.4957	20.4969	20.4832	20.3246	19.9872	19.7012	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7246	19.8649	20.0919	20.3420	20.4615	20.4939	20.4957	20.4969	20.4832	20.3246	19.9872	19.7012	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9918	0.9840	0.9589	0.8782	0.7121	0.4988	0.3458	0.3847	0.6378	0.9112	0.9823	0.9936	(94)
Useful gains	561.1572	605.8345	640.4733	629.7510	529.8520	361.0474	239.3013	250.8382	388.6961	510.4260	526.3198	538.9172	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	984.9451	952.8179	862.8718	715.7740	546.4698	362.1446	239.3634	250.9706	394.5768	606.5381	808.5720	978.3320	(97)
Space heating kWh	315.2982	233.1728	165.4645	61.9365	12.3636	0.0000	0.0000	0.0000	0.0000	71.5074	203.2216	326.9246	(98a)
Space heating requirement - total per year (kWh/year)												1389.8892	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	315.2982	233.1728	165.4645	61.9365	12.3636	0.0000	0.0000	0.0000	0.0000	71.5074	203.2216	326.9246	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1389.8892	
Space heating per m2											(98c) / (4) =	19.4254	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	315.2982	233.1728	165.4645	61.9365	12.3636	0.0000	0.0000	0.0000	0.0000	71.5074	203.2216	326.9246	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	315.2982	233.1728	165.4645	61.9365	12.3636	0.0000	0.0000	0.0000	0.0000	71.5074	203.2216	326.9246	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	63.9389	56.4501	59.7231	51.9101	49.9147	44.5358	43.6284	45.6045	46.3756	52.2427	56.2002	63.1612	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.1067	10.0319	11.1067	10.7485	11.1067	10.7485	11.1067	11.1067	10.7485	11.1067	10.7485	11.1067	(231)
Lighting	21.7426	17.4427	15.7052	11.5063	8.8878	7.2614	8.1078	10.5388	13.6888	17.9605	20.2864	22.3469	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1389.8892	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	633.6854	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	130.7728	(230a)
Total electricity for the above, kWh/year	130.7728	(231)
Electricity for lighting (calculated in Appendix L)	175.4754	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2329.8228	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1389.8892	16.4900	229.1927	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.6854	16.4900	104.4947	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	130.7728	16.4900	21.5644	(249)
Energy for lighting	175.4754	16.4900	28.9359	(250)
Additional standing charges			0.0000	(251)
Total energy cost			384.1878	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1867	(257)
SAP value		80.7639	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1389.8892	0.1570	218.2064	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.6854	0.1411	89.4427	(264)
Space and water heating			307.6491	(265)
Pumps, fans and electric keep-hot	130.7728	0.1387	18.1398	(267)
Energy for lighting	175.4754	0.1443	25.3265	(268)
Total CO2, kg/year			351.1154	(272)
CO2 emissions per m2			4.9100	(273)
EI value			95.9632	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.5500 (1b)	x	2.5500 (2b)	=	182.4525	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.5500						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4525	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes

Pressure Test Method	Blower Door	
Measured/design AP50	2.9000	(17)
Infiltration rate	0.1450	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1232	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1325	0.1263	0.1263	0.1171	0.1202	0.1048	0.1048	0.1017	0.1048	0.1171	0.1140	0.1232	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2685	0.2623	0.2623	0.2531	0.2562	0.2408	0.2408	0.2377	0.2408	0.2531	0.2500	0.2592	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Exposed Floor			71.5500	0.1275	9.1230	110.0000	7870.5000	(28b)
Brickwork	30.7200	10.8700	19.8500	0.2100	4.1685	110.0000	2183.4999	(29a)
Communal Wall	20.3100	2.1500	18.1600	0.2200	3.9952	110.0000	1997.5999	(29a)
Lift Shaft Wall	10.3900		10.3900	0.2100	2.1819	110.0000	1142.9000	(29a)
Total net area of external elements Aum(A, m2)			132.9700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.4951			(33)
Main dwelling								
Party Wall 1			39.9700	0.0000	0.0000	110.0000	4396.7001	(32)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	21158.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	295.7205	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	20.9900	0.0380	0.7976
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0160	0.2976
E20 Exposed floor (normal)	18.4000	0.1200	2.2080
P7 Party Wall - Exposed floor (normal)	13.6600	0.4800	6.5568
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.7104	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	46.2055	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.1658	15.7948	15.7948	15.2382	15.4237	14.4961	14.4961	14.3106	14.4961	15.2382	15.0527	15.6093	(38)
Heat transfer coeff	62.3714	62.0003	62.0003	61.4438	61.6293	60.7017	60.7017	60.5162	60.7017	61.4438	61.2582	61.8148	(39)
Average = Sum(39)m / 12 =												61.3819	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8717	0.8665	0.8665	0.8588	0.8613	0.8484	0.8484	0.8458	0.8484	0.8588	0.8562	0.8639	(40)
HLP (average)												0.8579	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2832	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.5007	61.5615	60.1928	57.5740	55.6415	53.4863	52.2613	53.6196	55.1086	57.4226	60.0976	62.2613	(42a)
Hot water usage for baths	27.0006	26.5996	26.0349	24.9937	24.2141	23.3496	22.8827	23.4434	24.0539	24.9790	26.0416	26.9093	(42b)
Hot water usage for other uses	38.0118	36.6296	35.2473	33.8651	32.4828	31.1006	31.1006	32.4828	33.8651	35.2473	36.6296	38.0118	(42c)
Average daily hot water use (litres/day)												117.2136	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5132	124.7906	121.4750	116.4328	112.3384	107.9365	106.2445	109.5458	113.0276	117.6489	122.7688	127.1824	(44)
Energy conte	201.9497	177.7002	186.7026	159.3907	151.2291	132.7205	128.4936	135.6406	139.3744	159.6485	174.9066	199.1369	(45)
Energy content (annual)											Total = Sum(45)m =	1946.8933	
Distribution loss (46)m = 0.15 x (45)m	30.2924	26.6550	28.0054	23.9086	22.6844	19.9081	19.2740	20.3461	20.9062	23.9473	26.2360	29.8705	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)
											Total per year (kWh/year) = Sum(64)m =	2291.8183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	67.1483	59.0853	62.0786	52.9974	50.2837	44.1296	42.7241	45.1005	46.3420	53.0831	58.1565	66.2130	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.8404	22.0630	17.9428	13.5839	10.1541	8.5725	9.2629	12.0403	16.1604	20.5194	23.9492	25.5307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.8318	302.9431	295.1027	278.4114	257.3416	237.5389	224.3096	221.1982	229.0387	245.7300	266.7998	286.6024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	(71)
Water heating gains (Table 5)													
	90.2530	87.9246	83.4390	73.6075	67.5856	61.2911	57.4249	60.6190	64.3639	71.3483	80.7729	88.9960	(72)
Total internal gains													
	511.5705	509.5760	493.1298	462.2481	431.7265	404.0478	387.6427	390.5028	406.2083	434.2429	468.1671	497.7744	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
West	5.4500	23.8018	0.3300	0.0000	0.7700	32.9618	(80)

Solar gains	65.7421	112.3310	183.3208	270.7289	322.6701	349.1703	329.2342	290.3536	227.0476	142.9844	80.7485	54.3745	(83)
Total gains	577.3125	621.9070	676.4506	732.9769	754.3966	753.2181	716.8769	680.8564	633.2558	577.2273	548.9156	552.1489	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	94.2331	94.7970	94.7970	95.6557	95.3677	96.8251	96.8251	97.1219	96.8251	95.6557	95.9454	95.0815	
alpha	7.2822	7.3198	7.3198	7.3770	7.3578	7.4550	7.4550	7.4748	7.4550	7.3770	7.3964	7.3388	
util living area													
	0.9918	0.9839	0.9531	0.8466	0.6506	0.4187	0.2794	0.3022	0.5711	0.8855	0.9793	0.9936	(86)
MIT	20.4259	20.5384	20.7279	20.9156	20.9885	20.9996	21.0000	21.0000	20.9965	20.9004	20.6446	20.4045	(87)
Th 2	20.1916	20.1960	20.1960	20.2027	20.2005	20.2116	20.2116	20.2138	20.2116	20.2027	20.2049	20.1983	(88)
util rest of house													
	0.9888	0.9782	0.9375	0.8072	0.5910	0.3554	0.2127	0.2323	0.4981	0.8444	0.9708	0.9912	(89)
MIT 2	19.5406	19.6852	19.9161	20.1298	20.1933	20.2115	20.2116	20.2138	20.2100	20.1193	19.8265	19.5190	(90)
Living area fraction										fLA = Living area / (4) =		0.3676	(91)
MIT	19.8660	19.9988	20.2145	20.4186	20.4856	20.5012	20.5014	20.5028	20.4991	20.4064	20.1272	19.8445	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8660	19.9988	20.2145	20.4186	20.4856	20.5012	20.5014	20.5028	20.4991	20.4064	20.1272	19.8445	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9765	0.9380	0.8185	0.6126	0.3787	0.2372	0.2580	0.5250	0.8559	0.9698	0.9899	(94)
Useful gains	569.9782	607.2852	634.4772	599.9474	462.1382	285.2410	170.0461	175.6606	332.4657	494.0224	532.3216	546.5634	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	920.9766	886.5308	794.5026	646.3045	467.4938	285.3687	170.0490	175.6658	333.8055	547.2437	742.8907	911.4270	(97)
Space heating kWh													
	261.1428	187.6530	119.0589	33.3771	3.9845	0.0000	0.0000	0.0000	0.0000	39.5966	151.6098	271.4586	(98a)
Space heating requirement - total per year (kWh/year)												1067.8814	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	261.1428	187.6530	119.0589	33.3771	3.9845	0.0000	0.0000	0.0000	0.0000	39.5966	151.6098	271.4586	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1067.8814	
Space heating per m2											(98c) / (4) =	14.9250	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	261.1428	187.6530	119.0589	33.3771	3.9845	0.0000	0.0000	0.0000	0.0000	39.5966	151.6098	271.4586	(98)

Space heating efficiency (main heating system 1)

100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)

261.1428	187.6530	119.0589	33.3771	3.9845	0.0000	0.0000	0.0000	0.0000	39.5966	151.6098	271.4586	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)

Efficiency of water heater 361.6650 (216)

(217)m 361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)

Fuel for water heating, kWh/month

63.9389	56.4501	59.7231	51.9101	49.9147	44.5358	43.6284	45.6045	46.3756	52.2427	56.2002	63.1612	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 11.1067	10.0319	11.1067	10.7485	11.1067	10.7485	11.1067	11.1067	10.7485	11.1067	10.7485	11.1067	(231)
Lighting 21.7426	17.4427	15.7052	11.5063	8.8878	7.2614	8.1078	10.5388	13.6888	17.9605	20.2864	22.3469	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1067.8814 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 633.6854 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 130.7728 (230a)
Total electricity for the above, kWh/year 130.7728 (231)
Electricity for lighting (calculated in Appendix L) 175.4754 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2007.8150 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1067.8814	27.6700	295.4828	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.6854	27.6700	175.3408	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	130.7728	27.6700	36.1848	(249)
Energy for lighting	175.4754	27.6700	48.5540	(250)
Additional standing charges			0.0000	(251)
Total energy cost			555.5624	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1067.8814	0.1579	168.6316	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.6854	0.1411	89.4427	(264)
Space and water heating			258.0743	(265)
Pumps, fans and electric keep-hot	130.7728	0.1387	18.1398	(267)
Energy for lighting	175.4754	0.1443	25.3265	(268)
Total CO2, kg/year			301.5406	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1067.8814	1.5846	1692.1393	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.6854	1.5219	964.4198	(278)
Space and water heating			2656.5591	(279)
Pumps, fans and electric keep-hot	130.7728	1.5128	197.8331	(281)
Energy for lighting	175.4754	1.5338	269.1500	(282)
Total Primary energy kWh/year			3123.5422	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N	Solar water heating		Not applicable
U	Solar photovoltaic panels		Not applicable
V2	Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£556	£556	£0
Space heating	£332	£332	£0
Water heating	£175	£175	£0
Lighting	£49	£49	£0
Total cost of fuels	£556	£556	£0
Total cost of uses	£556	£556	£0
Delivered energy	28 kWh/m²	28 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	44 kWh/m²	44 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.5500 (1b)	x	2.5500 (2b)	=	182.4525	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4525	(5)

---
2. Ventilation rate
---

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9000 (17)
Infiltration rate		0.1450 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1232 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1571	0.1541	0.1510	0.1356	0.1325	0.1171	0.1171	0.1140	0.1232	0.1325	0.1387	0.1448	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2931	0.2901	0.2870	0.2716	0.2685	0.2531	0.2531	0.2500	0.2592	0.2685	0.2747	0.2808 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Exposed Floor			71.5500	0.1275	9.1230	110.0000	7870.5000	(28b)
Brickwork	30.7200	10.8700	19.8500	0.2100	4.1685	110.0000	2183.4999	(29a)
Communal Wall	20.3100	2.1500	18.1600	0.2200	3.9952	110.0000	1997.5999	(29a)
Lift Shaft Wall	10.3900		10.3900	0.2100	2.1819	110.0000	1142.9000	(29a)
Total net area of external elements Aum(A, m2)			132.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.4951			(33)
Main dwelling								
Party Wall 1			39.9700	0.0000	0.0000	110.0000	4396.7001	(32)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21158.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 295.7205 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	20.9900	0.0380	0.7976
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0160	0.2976
E20 Exposed floor (normal)	18.4000	0.1200	2.2080
P7 Party Wall - Exposed floor (normal)	13.6600	0.4800	6.5568
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7104 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.2055 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.6500	17.4645	17.2789	16.3513	16.1658	15.2382	15.2382	15.0527	15.6093	16.1658	16.5369	16.9079	(38)
Heat transfer coeff	63.8555	63.6700	63.4845	62.5569	62.3714	61.4438	61.4438	61.2582	61.8148	62.3714	62.7424	63.1134	(39)
Average = Sum(39)m / 12 =												62.5105	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8925	0.8899	0.8873	0.8743	0.8717	0.8588	0.8588	0.8562	0.8639	0.8717	0.8769	0.8821	(40)
HLP (average)												0.8737	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2832 (42)
Hot water usage for mixer showers

62.5007	61.5615	60.1928	57.5740	55.6415	53.4863	52.2613	53.6196	55.1086	57.4226	60.0976	62.2613	(42a)

Hot water usage for baths

27.0006	26.5996	26.0349	24.9937	24.2141	23.3496	22.8827	23.4434	24.0539	24.9790	26.0416	26.9093	(42b)

Hot water usage for other uses

38.0118	36.6296	35.2473	33.8651	32.4828	31.1006	31.1006	32.4828	33.8651	35.2473	36.6296	38.0118	(42c)

Average daily hot water use (litres/day) 117.2136 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5132	124.7906	121.4750	116.4328	112.3384	107.9365	106.2445	109.5458	113.0276	117.6489	122.7688	127.1824	(44)
Energy conte	201.9497	177.7002	186.7026	159.3907	151.2291	132.7205	128.4936	135.6406	139.3744	159.6485	174.9066	199.1369	(45)
Energy content (annual)										Total = Sum(45)m =		1946.8933	
Distribution loss (46)m = 0.15 x (45)m	30.2924	26.6550	28.0054	23.9086	22.6844	19.9081	19.2740	20.3461	20.9062	23.9473	26.2360	29.8705	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)
										Total per year (kWh/year) = Sum(64)m =		2291.8183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	67.1483	59.0853	62.0786	52.9974	50.2837	44.1296	42.7241	45.1005	46.3420	53.0831	58.1565	66.2130	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.8404	22.0630	17.9428	13.5839	10.1541	8.5725	9.2629	12.0403	16.1604	20.5194	23.9492	25.5307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.8318	302.9431	295.1027	278.4114	257.3416	237.5389	224.3096	221.1982	229.0387	245.7300	266.7998	286.6024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	(71)
Water heating gains (Table 5)													
	90.2530	87.9246	83.4390	73.6075	67.5856	61.2911	57.4249	60.6190	64.3639	71.3483	80.7729	88.9960	(72)
Total internal gains													
	511.5705	509.5760	493.1298	462.2481	431.7265	404.0478	387.6427	390.5028	406.2083	434.2429	468.1671	497.7744	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
West	5.4500	19.6403	0.3300	0.0000	0.7700	27.1987	(80)

Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107	(83)
Total gains	565.8182	615.6960	667.8944	717.1318	744.0962	723.8137	692.0728	652.0038	609.4667	560.1633	535.8076	542.3851	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	92.0429	92.3110	92.5808	93.9536	94.2331	95.6557	95.6557	95.9454	95.0815	94.2331	93.6758	93.1251	
alpha	7.1362	7.1541	7.1721	7.2636	7.2822	7.3770	7.3770	7.3964	7.3388	7.2822	7.2451	7.2083	
util living area													
	0.9949	0.9894	0.9704	0.9014	0.7474	0.5405	0.3904	0.4317	0.6837	0.9333	0.9885	0.9961	(86)
MIT	20.3128	20.4321	20.6278	20.8487	20.9673	20.9972	20.9998	20.9996	20.9865	20.8276	20.5313	20.2890	(87)
Th 2	20.1739	20.1761	20.1783	20.1894	20.1916	20.2027	20.2027	20.2049	20.1983	20.1916	20.1872	20.1828	(88)
util rest of house													
	0.9930	0.9857	0.9602	0.8721	0.6934	0.4746	0.3198	0.3574	0.6114	0.9061	0.9838	0.9947	(89)
MIT 2	19.3827	19.5353	19.7803	20.0475	20.1676	20.2014	20.2026	20.2048	20.1907	20.0323	19.6709	19.3595	(90)
Living area fraction										fLA = Living area / (4) =		0.3676	(91)
MIT	19.7246	19.8649	20.0919	20.3420	20.4615	20.4939	20.4957	20.4969	20.4832	20.3246	19.9872	19.7012	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7246	19.8649	20.0919	20.3420	20.4615	20.4939	20.4957	20.4969	20.4832	20.3246	19.9872	19.7012	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9918	0.9840	0.9589	0.8782	0.7121	0.4988	0.3458	0.3847	0.6378	0.9112	0.9823	0.9936	(94)
Useful gains	561.1572	605.8345	640.4733	629.7510	529.8520	361.0474	239.3013	250.8382	388.6961	510.4260	526.3198	538.9172	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	984.9451	952.8179	862.8718	715.7740	546.4698	362.1446	239.3634	250.9706	394.5768	606.5381	808.5720	978.3320	(97)
Space heating kWh													
	315.2982	233.1728	165.4645	61.9365	12.3636	0.0000	0.0000	0.0000	0.0000	71.5074	203.2216	326.9246	(98a)
Space heating requirement - total per year (kWh/year)												1389.8892	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	315.2982	233.1728	165.4645	61.9365	12.3636	0.0000	0.0000	0.0000	0.0000	71.5074	203.2216	326.9246	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1389.8892	
Space heating per m2											(98c) / (4) =	19.4254	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	315.2982	233.1728	165.4645	61.9365	12.3636	0.0000	0.0000	0.0000	0.0000	71.5074	203.2216	326.9246	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	315.2982	233.1728	165.4645	61.9365	12.3636	0.0000	0.0000	0.0000	0.0000	71.5074	203.2216	326.9246	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)

Fuel for water heating, kWh/month

	63.9389	56.4501	59.7231	51.9101	49.9147	44.5358	43.6284	45.6045	46.3756	52.2427	56.2002	63.1612 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	11.1067	10.0319	11.1067	10.7485	11.1067	10.7485	11.1067	11.1067	10.7485	11.1067	10.7485	11.1067 (231)
Lighting	21.7426	17.4427	15.7052	11.5063	8.8878	7.2614	8.1078	10.5388	13.6888	17.9605	20.2864	22.3469 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1389.8892	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	633.6854	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	130.7728	(230a)
Total electricity for the above, kWh/year	130.7728	(231)
Electricity for lighting (calculated in Appendix L)	175.4754	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2329.8228	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1389.8892	16.4900	229.1927	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.6854	16.4900	104.4947	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	130.7728	16.4900	21.5644	(249)
Energy for lighting	175.4754	16.4900	28.9359	(250)
Additional standing charges			0.0000	(251)
Total energy cost			384.1878	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1867	(257)
SAP value		80.7639	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1389.8892	0.1570	218.2064	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.6854	0.1411	89.4427	(264)
Space and water heating			307.6491	(265)
Pumps, fans and electric keep-hot	130.7728	0.1387	18.1398	(267)
Energy for lighting	175.4754	0.1443	25.3265	(268)
Total CO2, kg/year			351.1154	(272)
CO2 emissions per m2			4.9100	(273)
EI value			95.9632	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.5500 (1b)	x	2.5500 (2b)	=	182.4525	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4525	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9000	(17)
Infiltration rate		0.1450	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1232	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1325	0.1263	0.1263	0.1171	0.1202	0.1048	0.1048	0.1017	0.1048	0.1171	0.1140	0.1232	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2685	0.2623	0.2623	0.2531	0.2562	0.2408	0.2408	0.2377	0.2408	0.2531	0.2500	0.2592	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Exposed Floor			71.5500	0.1275	9.1230	110.0000	7870.5000	(28b)
Brickwork	30.7200	10.8700	19.8500	0.2100	4.1685	110.0000	2183.4999	(29a)
Communal Wall	20.3100	2.1500	18.1600	0.2200	3.9952	110.0000	1997.5999	(29a)
Lift Shaft Wall	10.3900		10.3900	0.2100	2.1819	110.0000	1142.9000	(29a)
Total net area of external elements Aum(A, m2)			132.9700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.4951			(33)
Main dwelling								
Party Wall 1			39.9700	0.0000	0.0000	110.0000	4396.7001	(32)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21158.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	295.7205	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	20.9900	0.0380	0.7976
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0160	0.2976
E20 Exposed floor (normal)	18.4000	0.1200	2.2080
P7 Party Wall - Exposed floor (normal)	13.6600	0.4800	6.5568
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.7104	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 46.2055	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.1658	15.7948	15.7948	15.2382	15.4237	14.4961	14.4961	14.3106	14.4961	15.2382	15.0527	15.6093	(38)
Heat transfer coeff	62.3714	62.0003	62.0003	61.4438	61.6293	60.7017	60.7017	60.5162	60.7017	61.4438	61.2582	61.8148	(39)
Average = Sum(39)m / 12 =												61.3819	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8717	0.8665	0.8665	0.8588	0.8613	0.8484	0.8484	0.8458	0.8484	0.8588	0.8562	0.8639	(40)
HLP (average)												0.8579	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2832	(42)

Hot water usage for mixer showers

	62.5007	61.5615	60.1928	57.5740	55.6415	53.4863	52.2613	53.6196	55.1086	57.4226	60.0976	62.2613	(42a)

Hot water usage for baths

	27.0006	26.5996	26.0349	24.9937	24.2141	23.3496	22.8827	23.4434	24.0539	24.9790	26.0416	26.9093	(42b)

Hot water usage for other uses

	38.0118	36.6296	35.2473	33.8651	32.4828	31.1006	31.1006	32.4828	33.8651	35.2473	36.6296	38.0118 (42c)

Average daily hot water use (litres/day) 117.2136 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5132	124.7906	121.4750	116.4328	112.3384	107.9365	106.2445	109.5458	113.0276	117.6489	122.7688	127.1824	(44)
Energy conte	201.9497	177.7002	186.7026	159.3907	151.2291	132.7205	128.4936	135.6406	139.3744	159.6485	174.9066	199.1369	(45)
Energy content (annual)										Total = Sum(45)m =		1946.8933	
Distribution loss (46)m = 0.15 x (45)m	30.2924	26.6550	28.0054	23.9086	22.6844	19.9081	19.2740	20.3461	20.9062	23.9473	26.2360	29.8705	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)
										Total per year (kWh/year) = Sum(64)m =		2291.8183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	67.1483	59.0853	62.0786	52.9974	50.2837	44.1296	42.7241	45.1005	46.3420	53.0831	58.1565	66.2130	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	136.9896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.8404	22.0630	17.9428	13.5839	10.1541	8.5725	9.2629	12.0403	16.1604	20.5194	23.9492	25.5307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.8318	302.9431	295.1027	278.4114	257.3416	237.5389	224.3096	221.1982	229.0387	245.7300	266.7998	286.6024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	50.9821	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	-91.3264	(71)
Water heating gains (Table 5)	90.2530	87.9246	83.4390	73.6075	67.5856	61.2911	57.4249	60.6190	64.3639	71.3483	80.7729	88.9960	(72)
Total internal gains	511.5705	509.5760	493.1298	462.2481	431.7265	404.0478	387.6427	390.5028	406.2083	434.2429	468.1671	497.7744	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
West	5.4500	23.8018	0.3300	0.0000	0.7700	32.9618	(80)

Solar gains	65.7421	112.3310	183.3208	270.7289	322.6701	349.1703	329.2342	290.3536	227.0476	142.9844	80.7485	54.3745	(83)
Total gains	577.3125	621.9070	676.4506	732.9769	754.3966	753.2181	716.8769	680.8564	633.2558	577.2273	548.9156	552.1489	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	94.2331	94.7970	94.7970	95.6557	95.3677	96.8251	96.8251	97.1219	96.8251	95.6557	95.9454	95.0815	
alpha	7.2822	7.3198	7.3198	7.3770	7.3578	7.4550	7.4550	7.4748	7.4550	7.3770	7.3964	7.3388	
util living area	0.9918	0.9839	0.9531	0.8466	0.6506	0.4187	0.2794	0.3022	0.5711	0.8855	0.9793	0.9936	(86)
MIT	20.4259	20.5384	20.7279	20.9156	20.9885	20.9996	21.0000	21.0000	20.9965	20.9004	20.6446	20.4045	(87)
Th 2	20.1916	20.1960	20.1960	20.2027	20.2005	20.2116	20.2116	20.2138	20.2116	20.2027	20.2049	20.1983	(88)
util rest of house	0.9888	0.9782	0.9375	0.8072	0.5910	0.3554	0.2127	0.2323	0.4981	0.8444	0.9708	0.9912	(89)
MIT 2	19.5406	19.6852	19.9161	20.1298	20.1933	20.2115	20.2116	20.2138	20.2100	20.1193	19.8265	19.5190	(90)
Living area fraction										fLA = Living area / (4) =		0.3676	(91)
MIT	19.8660	19.9988	20.2145	20.4186	20.4856	20.5012	20.5014	20.5028	20.4991	20.4064	20.1272	19.8445	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8660	19.9988	20.2145	20.4186	20.4856	20.5012	20.5014	20.5028	20.4991	20.4064	20.1272	19.8445	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9765	0.9380	0.8185	0.6126	0.3787	0.2372	0.2580	0.5250	0.8559	0.9698	0.9899	(94)
Useful gains	569.9782	607.2852	634.4772	599.9474	462.1382	285.2410	170.0461	175.6606	332.4657	494.0224	532.3216	546.5634	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	920.9766	886.5308	794.5026	646.3045	467.4938	285.3687	170.0490	175.6658	333.8055	547.2437	742.8907	911.4270	(97)
Space heating kWh													

	261.1428	187.6530	119.0589	33.3771	3.9845	0.0000	0.0000	0.0000	0.0000	39.5966	151.6098	271.4586 (98a)
Space heating requirement - total per year (kWh/year)												1067.8814
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	261.1428	187.6530	119.0589	33.3771	3.9845	0.0000	0.0000	0.0000	0.0000	39.5966	151.6098	271.4586 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1067.8814
Space heating per m2											(98c) / (4) =	14.9250 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	261.1428	187.6530	119.0589	33.3771	3.9845	0.0000	0.0000	0.0000	0.0000	39.5966	151.6098	271.4586	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	261.1428	187.6530	119.0589	33.3771	3.9845	0.0000	0.0000	0.0000	0.0000	39.5966	151.6098	271.4586	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	231.2447	204.1602	215.9976	187.7407	180.5241	161.0705	157.7886	164.9356	167.7244	188.9435	203.2566	228.4319	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	63.9389	56.4501	59.7231	51.9101	49.9147	44.5358	43.6284	45.6045	46.3756	52.2427	56.2002	63.1612	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.1067	10.0319	11.1067	10.7485	11.1067	10.7485	11.1067	11.1067	10.7485	11.1067	10.7485	11.1067	(231)
Lighting	21.7426	17.4427	15.7052	11.5063	8.8878	7.2614	8.1078	10.5388	13.6888	17.9605	20.2864	22.3469	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1067.8814	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												633.6854	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												130.7728	(230a)
Total electricity for the above, kWh/year												130.7728	(231)
Electricity for lighting (calculated in Appendix L)												175.4754	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2007.8150	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1067.8814	27.6700	295.4828	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.6854	27.6700	175.3408	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	130.7728	27.6700	36.1848	(249)
Energy for lighting	175.4754	27.6700	48.5540	(250)
Additional standing charges			0.0000	(251)
Total energy cost			555.5624	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1067.8814	0.1579	168.6316	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.6854	0.1411	89.4427	(264)
Space and water heating			258.0743	(265)
Pumps, fans and electric keep-hot	130.7728	0.1387	18.1398	(267)
Energy for lighting	175.4754	0.1443	25.3265	(268)
Total CO2, kg/year			301.5406	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1067.8814	1.5846	1692.1393	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.6854	1.5219	964.4198	(278)
Space and water heating			2656.5591	(279)
Pumps, fans and electric keep-hot	130.7728	1.5128	197.8331	(281)
Energy for lighting	175.4754	1.5338	269.1500	(282)
Total Primary energy kWh/year			3123.5422	(286)

Summary for Input Data

Plot Reference	P-12	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-12
Plot Address	Flat 3, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	77 C	**DER**	5.82	**TER**	14.18
Environmental	95 A	**% DER < TER**			58.96
CO_2 Emissions (t/year)	0.43	**DFEE**	43.10	**TFEE**	45.41
Compliance Check	See BREL	**% DFEE < TFEE**			5.09
% DPER < TPER	20.23	**DPER**	59.86	**TPER**	75.04

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	270.77	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	31.68 m	91.22 m²	2.55 m

8.0 Living Area 34.35 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	61.07	40.95	0.00	None	20.12	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	4.85	2.79	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	18.14	18.14	0.60	Stairwell Access Corridor 2	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	32.65	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	170.03

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	91.22

11.0 Heat Loss Floors

Summary for Input Data

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Exposed Floor	Exposed Floor - Solid	Lowest occupied	Other	0.14	Stairwell Stairwell 1	2.10	110.00	91.22

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	North	2.06	
Patio Door	Patio Door	Brickwork	West	6.50	
West	Window	Brickwork	West	8.17	
North	Window	Brickwork	North	5.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	40.36	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	5.70	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	11.16	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	2.65	0.33	0.33	Abbey Calculated	No
E20 Exposed floor (normal)	Independently assessed	20.35	0.12	0.12	-	No
P7 Party Wall - Exposed floor (normal)	Table K1 - Default	11.16	0.48	0.48	-	No
E2 Other lintels (including other steel lintels)	Independently assessed	9.41	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	33.00	0.02	0.02	RCD	Yes
E16 Corner (normal)	Gov Approved Scheme	11.40	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.70	-0.10	-0.10	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No
E21 Exposed floor (inverted)	Table K1 - Default	8.69	0.32	0.32		No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value	0.10	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0

Summary for Input Data

Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.95	$m^3/(h.m^2)$ @ 50 Pa
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	9
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	
28.0 Water Heating		
Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

Summary for Input Data

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-12	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-12
Plot Address	Flat 3, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	77 C	**DER**	5.82	**TER**	14.18
Environmental	95 A	**% DER < TER**			58.96
CO_2 Emissions (t/year)	0.43	**DFEE**	43.10	**TFEE**	45.41
Compliance Check	See BREL	**% DFEE < TFEE**			5.09
% DPER < TPER	20.23	**DPER**	59.86	**TPER**	75.04

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	232.6110	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9500	(17)
Infiltration rate		0.1475	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

Effective ac	0.2959	0.2927	0.2896	0.2739	0.2708	0.2551	0.2551	0.2520	0.2614	0.2708	0.2770	0.2833	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Exposed Floor			91.2200	0.1082	9.8692	110.0000	10034.2000	(28b)
Brickwork	61.0700	20.1200	40.9500	0.2100	8.5995	110.0000	4504.5000	(29a)
Communal Wall	4.8500	2.0600	2.7900	0.2200	0.6138	110.0000	306.9000	(29a)
Stairwell Wall	18.1400		18.1400	0.2200	3.9908	110.0000	1995.3999	(29a)
Total net area of external elements Aum(A, m2)			175.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5835			(33)
Main dwelling								
Party Wall 1			32.6500	0.0000	0.0000	110.0000	3591.5002	(32)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			170.0300			9.0000	1530.2700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 24699.3700	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 270.7670 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	40.3600	0.0380	1.5337
E18	Party wall between dwellings	5.7000	0.0380	0.2166
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1600	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	2.6500	0.3300	0.8745
E20	Exposed floor (normal)	20.3500	0.1200	2.4420
P7	Party Wall - Exposed floor (normal)	11.1600	0.4800	5.3568
E2	Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E4	Jamb	33.0000	0.0160	0.5280
E16	Corner (normal)	11.4000	0.0540	0.6156
E17	Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E25	Staggered party wall between dwellings	2.8500	0.0310	0.0883
E21	Exposed floor (inverted)	8.6900	0.3200	2.7808
E5	Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.0979 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.6814 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.7102	22.4696	22.2290	21.0260	20.7854	19.5824	19.5824	19.3418	20.0636	20.7854	21.2666	21.7478	(38)
Heat transfer coeff	88.3916	88.1510	87.9104	86.7074	86.4668	85.2638	85.2638	85.0232	85.7450	86.4668	86.9480	87.4292	(39)
Average = Sum(39)m / 12 =												86.6473	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9690	0.9664	0.9637	0.9505	0.9479	0.9347	0.9347	0.9321	0.9400	0.9479	0.9532	0.9584	(40)
HLP (average)												0.9499	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)
Hot water usage for mixer showers

68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 128.5022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
										Total per year (kWh/year) = Sum(64)m =		2479.3192	(64)
12Total per year (kWh/year)												2479	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)	98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)
Total internal gains	524.6232	537.6181	513.3465	493.1932	465.5762	446.7964	427.8529	428.8508	443.3245	460.3566	491.7039	512.5981	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

West			6.5000	19.6403	0.3300	0.0000	0.7700				32.4388	(80)
North			5.4500	10.6334	0.3300	0.0000	0.7700				14.7256	(74)
West			8.1700	19.6403	0.3300	0.0000	0.7700				40.7731	(80)
Solar gains	87.9376	171.3595	283.6790	420.7973	525.0394	542.3190	514.2702	434.9651	331.8088	203.4390	109.4526	72.4819	(83)
Total gains	612.5607	708.9776	797.0255	913.9905	990.6155	989.1153	942.1231	863.8159	775.1333	663.7957	601.1565	585.0801	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.6198	77.8316	78.0446	79.1274	79.3476	80.4672	80.4672	80.6949	80.0156	79.3476	78.9085	78.4742	
alpha	6.1747	6.1888	6.2030	6.2752	6.2898	6.3645	6.3645	6.3797	6.3344	6.2898	6.2606	6.2316	
util living area	0.9974	0.9931	0.9789	0.9144	0.7591	0.5460	0.3975	0.4512	0.7254	0.9564	0.9936	0.9981	(86)
MIT	20.0155	20.1859	20.4368	20.7564	20.9404	20.9936	20.9993	20.9984	20.9664	20.6980	20.3025	19.9912	(87)
Th 2	20.1093	20.1115	20.1137	20.1248	20.1270	20.1381	20.1381	20.1403	20.1336	20.1270	20.1225	20.1181	(88)
util rest of house	0.9965	0.9908	0.9716	0.8881	0.7040	0.4751	0.3200	0.3678	0.6494	0.9370	0.9910	0.9974	(89)
MIT 2	18.9601	19.1787	19.4964	19.8881	20.0812	20.1348	20.1379	20.1398	20.1131	19.8312	19.3369	18.9358	(90)
Living area fraction									fLA = Living area / (4) =			0.3766	(91)
MIT	19.3576	19.5580	19.8505	20.2150	20.4047	20.4582	20.4622	20.4631	20.4344	20.1576	19.7005	19.3332	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3576	19.5580	19.8505	20.2150	20.4047	20.4582	20.4622	20.4631	20.4344	20.1576	19.7005	19.3332	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9889	0.9690	0.8911	0.7223	0.5017	0.3493	0.3992	0.6769	0.9378	0.9893	0.9965	(94)
Useful gains	609.8062	701.0758	772.3120	814.4853	715.5358	496.2734	329.0435	344.8619	524.7029	622.5227	594.7420	583.0544	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1330.9612	1292.1163	1173.6488	981.0986	752.6703	499.4910	329.3100	345.4615	543.1453	826.4188	1095.5887	1323.0879	(97)
Space heating kWh	536.5394	397.1792	298.5946	119.9616	27.6281	0.0000	0.0000	0.0000	0.0000	151.6987	360.6096	550.5849	(98a)
Space heating requirement - total per year (kWh/year)												2442.7961	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	536.5394	397.1792	298.5946	119.9616	27.6281	0.0000	0.0000	0.0000	0.0000	151.6987	360.6096	550.5849	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2442.7961	
Space heating per m2											(98c) / (4) =	26.7792	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	536.5394	397.1792	298.5946	119.9616	27.6281	0.0000	0.0000	0.0000	0.0000	151.6987	360.6096	550.5849	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	536.5394	397.1792	298.5946	119.9616	27.6281	0.0000	0.0000	0.0000	0.0000	151.6987	360.6096	550.5849	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601	(231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	2442.7961	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	685.5292	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	166.7239	(230a)
Total electricity for the above, kWh/year	166.7239	(231)
Electricity for lighting (calculated in Appendix L)	199.9782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3495.0275	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2442.7961	0.1565	382.3194	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			479.1020	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			531.0917	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2442.7961	1.5794	3858.1860	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	1.5220	1043.4058	(278)
Space and water heating			4901.5917	(279)
Pumps, fans and electric keep-hot	166.7239	1.5128	252.2200	(281)
Energy for lighting	199.9782	1.5338	306.7333	(282)
Total Primary energy kWh/year			5460.5450	(286)
Dwelling Primary energy Rate (DPER)			59.8600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.6110	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1290	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3790	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3221	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4107	0.4027	0.3946	0.3543	0.3463	0.3060	0.3060	0.2980	0.3221	0.3463	0.3624	0.3785 (22b)
Effective ac	0.5843	0.5811	0.5779	0.5628	0.5600	0.5468	0.5468	0.5444	0.5519	0.5600	0.5657	0.5716 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.1200	1.1450	23.0382			(27)
Exposed Floor			91.2200	0.1300	11.8586			(28b)
Brickwork	61.0700	20.1200	40.9500	0.1800	7.3710			(29a)
Communal Wall	4.8500	2.0600	2.7900	0.1800	0.5022			(29a)
Stairwell Wall	18.1400		18.1400	0.1800	3.2652			(29a)
Total net area of external elements Aum(A, m2)			175.2800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.0952			(33)
Main dwelling								
Party Wall 1			32.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	270.7670	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	40.3600	0.0700	2.8252
E18 Party wall between dwellings	5.7000	0.0600	0.3420
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6500	0.0200	0.0530
E20 Exposed floor (normal)	20.3500	0.3200	6.5120
P7 Party Wall - Exposed floor (normal)	11.1600	0.1600	1.7856
E2 Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E4 Jamb	33.0000	0.0500	1.6500
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E21 Exposed floor (inverted)	8.6900	0.3200	2.7808
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	21.0231	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	69.1183	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.8550	44.6036	44.3572	43.1997	42.9832	41.9751	41.9751	41.7884	42.3634	42.9832	43.4213	43.8792	(38)
Heat transfer coeff	113.9732	113.7218	113.4754	112.3180	112.1014	111.0934	111.0934	110.9067	111.4817	112.1014	112.5395	112.9975	(39)
Average = Sum(39)m / 12 =												112.3170	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2494	1.2467	1.2440	1.2313	1.2289	1.2179	1.2179	1.2158	1.2221	1.2289	1.2337	1.2387	(40)
HLP (average)												1.2313	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6421	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day)	128.5022	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)

Water storage loss (or HIU loss):		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.7527	(55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

267.9943	236.8998	251.2780	219.8328	212.3880	190.5938	187.4632	195.2989	197.8894	221.6191	236.8437	264.9107	(62)
WWHRS -31.3237	-27.7029	-29.0089	-24.0205	-22.3863	-19.1561	-17.9558	-19.0942	-19.8196	-23.3652	-26.4699	-30.7436	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

236.6706	209.1968	222.2690	195.8123	190.0017	171.4377	169.5074	176.2047	178.0697	198.2540	210.3738	234.1671	(64)
									Total per year (kWh/year) = Sum(64)m =		2391.9648	(64)
12Total per year (kWh/year)											2392	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

110.8912	98.4442	105.3330	94.1748	92.4021	84.4529	84.1146	86.7200	86.8786	95.4715	99.8310	109.8659	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)													
	149.0473	146.4944	141.5767	130.7984	124.1964	117.2957	113.0573	116.5591	120.6648	128.3219	138.6541	147.6693	(72)
Total internal gains													
	577.7252	590.7201	566.4486	546.2952	518.6782	496.8984	477.9549	478.9528	493.4265	513.4587	544.8060	565.7002	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.4500	10.6334	0.6300	0.7000	0.7700	17.7109	(74)
West	14.6700	19.6403	0.6300	0.7000	0.7700	88.0540	(80)

Solar gains	105.7649	206.0988	341.1884	506.1044	631.4792	652.2618	618.5268	523.1444	399.0755	244.6817	131.6417	87.1760	(83)
Total gains	683.4901	796.8189	907.6370	1052.3996	1150.1574	1149.1602	1096.4818	1002.0972	892.5020	758.1403	676.4476	652.8762	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.1978	60.3309	60.4619	61.0849	61.2029	61.7583	61.7583	61.8623	61.5432	61.2029	60.9647	60.7176	
alpha	5.0132	5.0221	5.0308	5.0723	5.0802	5.1172	5.1172	5.1242	5.1029	5.0802	5.0643	5.0478	
util living area													
	0.9962	0.9913	0.9769	0.9218	0.7919	0.5974	0.4418	0.5011	0.7684	0.9576	0.9918	0.9970	(86)
MIT	19.6745	19.8707	20.1765	20.5769	20.8567	20.9733	20.9952	20.9913	20.9091	20.5214	20.0287	19.6450	(87)
Th 2	19.8807	19.8828	19.8850	19.8951	19.8969	19.9057	19.9057	19.9074	19.9023	19.8969	19.8931	19.8891	(88)
util rest of house													
	0.9949	0.9882	0.9684	0.8943	0.7300	0.5046	0.3341	0.3863	0.6799	0.9367	0.9883	0.9959	(89)
MIT 2	18.3560	18.6071	18.9938	19.4851	19.7862	19.8923	19.9045	19.9048	19.8463	19.4334	18.8173	18.3243	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	18.8525	19.0829	19.4392	19.8962	20.1893	20.2994	20.3152	20.3139	20.2465	19.8431	19.2735	18.8216	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8525	19.0829	19.4392	19.8962	20.1893	20.2994	20.3152	20.3139	20.2465	19.8431	19.2735	18.8216	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9851	0.9641	0.8944	0.7477	0.5389	0.3748	0.4298	0.7099	0.9355	0.9856	0.9944	(94)
Useful gains	678.7473	784.9681	875.0208	941.2180	859.9396	619.3388	410.9963	430.6744	633.6290	709.2161	666.7087	649.2236	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1658.5942	1612.9055	1468.2790	1235.0742	951.6637	633.1614	412.7352	434.0769	685.2265	1036.1643	1369.9958	1652.2081	(97)
Space heating kWh													
	729.0061	556.3739	441.3841	211.5765	68.2427	0.0000	0.0000	0.0000	0.0000	243.2494	506.3667	746.2204	(98a)
Space heating requirement - total per year (kWh/year)												3502.4199	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	729.0061	556.3739	441.3841	211.5765	68.2427	0.0000	0.0000	0.0000	0.0000	243.2494	506.3667	746.2204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3502.4199	
Space heating per m2											(98c) / (4) =	38.3953	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	729.0061	556.3739	441.3841	211.5765	68.2427	0.0000	0.0000	0.0000	0.0000	243.2494	506.3667	746.2204	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	789.8224	602.7887	478.2060	229.2269	73.9358	0.0000	0.0000	0.0000	0.0000	263.5422	548.6097	808.4728	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	236.6706	209.1968	222.2690	195.8123	190.0017	171.4377	169.5074	176.2047	178.0697	198.2540	210.3738	234.1671	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4115	86.1451	85.5679	84.2338	81.9961	79.8000	79.8000	79.8000	79.8000	84.5196	85.9546	86.4706	(217)
Fuel for water heating, kWh/month													
	273.8878	242.8423	259.7576	232.4629	231.7205	214.8342	212.4152	220.8079	223.1450	234.5657	244.7498	270.8053	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.2957	20.2932	18.2717	13.3867	10.3402	8.4481	9.4327	12.2610	15.9258	20.8956	23.6015	25.9988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.1402	-35.6046	-53.5094	-62.9858	-70.3728	-66.5635	-65.7299	-60.8239	-52.6145	-41.9297	-27.0849	-20.6899	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2508	-19.8354	-40.1368	-61.3477	-82.1777	-82.9765	-82.0211	-68.9772	-49.9301	-28.7356	-12.4671	-7.2891	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3794.6045	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2861.9942	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.1510	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1127.1943	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5819.5554	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3794.6045	0.2100	796.8669	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.9942	0.2100	601.0188	(264)
Space and water heating			1397.8857	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.1510	0.1443	29.4653	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.0490	0.1337	-77.7943	
PV Unit electricity exported	-545.1453	0.1254	-68.3500	
Total			-146.1443	(269)
Total CO2, kg/year			1293.1360	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3794.6045	1.1300	4287.9031	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.9942	1.1300	3234.0534	(278)
Space and water heating			7521.9565	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.1510	1.5338	313.1336	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.0490	1.4939	-869.5328	
PV Unit electricity exported	-545.1453	0.4602	-250.8778	
Total			-1120.4106	(283)
Total Primary energy kWh/year			6844.7803	(286)
Target Primary Energy Rate (TPER)			75.0400	(287)

Full SAP Calculation Printout

Plot Reference	P-12	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-12
Plot Address	Flat 3, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	77 C	**DER**	5.82	**TER**	14.18
Environmental	95 A	**% DER < TER**			58.96
CO_2 Emissions (t/year)	0.43	**DFEE**	43.10	**TFEE**	45.41
Compliance Check	See BREL	**% DFEE < TFEE**			5.09
% DPER < TPER	20.23	**DPER**	59.86	**TPER**	75.04

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	232.6110	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1290	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9500	(17)
Infiltration rate		0.2765	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2350	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2996	0.2938	0.2879	0.2585	0.2526	0.2233	0.2233	0.2174	0.2350	0.2526	0.2644	0.2761	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5449	0.5431	0.5414	0.5334	0.5319	0.5249	0.5249	0.5236	0.5276	0.5319	0.5349	0.5381	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Exposed Floor			91.2200	0.1082	9.8692	110.0000	10034.2000	(28b)
Brickwork	61.0700	20.1200	40.9500	0.2100	8.5995	110.0000	4504.5000	(29a)
Communal Wall	4.8500	2.0600	2.7900	0.2200	0.6138	110.0000	306.9000	(29a)
Stairwell Wall	18.1400		18.1400	0.2200	3.9908	110.0000	1995.3999	(29a)
Total net area of external elements Aum(A, m2)			175.2800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.5835			(33)
Main dwelling								
Party Wall 1			32.6500	0.0000	0.0000	110.0000	3591.5002	(32)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			170.0300			9.0000	1530.2700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 24699.3700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	270.7670 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	40.3600	0.0380	1.5337	
E18 Party wall between dwellings	5.7000	0.0380	0.2166	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1600	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6500	0.3300	0.8745	
E20 Exposed floor (normal)	20.3500	0.1200	2.4420	
P7 Party Wall - Exposed floor (normal)	11.1600	0.4800	5.3568	
E2 Other lintels (including other steel lintels)	9.4100	0.0500	0.4705	
E4 Jamb	33.0000	0.0160	0.5280	
E16 Corner (normal)	11.4000	0.0540	0.6156	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	
E21 Exposed floor (inverted)	8.6900	0.3200	2.7808	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.0979 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.6814 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.8265	41.6927	41.5615	40.9455	40.8303	40.2937	40.2937	40.1944	40.5004	40.8303	41.0634	41.3072	(38)
Heat transfer coeff	107.5079	107.3741	107.2430	106.6269	106.5117	105.9752	105.9752	105.8758	106.1818	106.5117	106.7449	106.9886	(39)
Average = Sum(39)m / 12 =												106.6264	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1786	1.1771	1.1757	1.1689	1.1676	1.1618	1.1618	1.1607	1.1640	1.1676	1.1702	1.1729	(40)
HLP (average)												1.1689	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 65.3306 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2756	69.3203	67.1856	64.5287	62.1585	59.6952	59.1835	61.3139	63.4989	66.0284	68.7088	71.1756	(44)
Energy conte	112.8831	98.7112	103.2617	88.3366	83.6772	73.4022	71.5773	75.9194	78.3004	89.6000	97.8883	111.4438	(45)
Energy content (annual)										Total = Sum(45)m =		1085.0013	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

95.9507	83.9045	87.7725	75.0861	71.1256	62.3919	60.8407	64.5315	66.5554	76.1600	83.2050	94.7272	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

95.9507	83.9045	87.7725	75.0861	71.1256	62.3919	60.8407	64.5315	66.5554	76.1600	83.2050	94.7272	(64)
									Total per year (kWh/year) = Sum(64)m =		922.2511	(64)
12Total per year (kWh/year)											922	(64)

Electric shower(s)

54.8717	48.8912	53.3873	50.9468	51.9028	49.5103	51.1606	51.9028	50.9468	53.3873	52.3834	54.8717	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		624.1629	(64a)

Heat gains from water heating, kWh/month

37.7056	33.1989	35.2899	31.5082	30.7571	27.9755	28.0003	29.1086	29.3756	32.3868	33.8971	37.3997	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)	50.6796	49.4031	47.4327	43.7614	41.3402	38.8549	37.6349	39.1244	40.7994	43.5307	47.0793	50.2685	(72)
Total internal gains	476.3575	490.6289	469.3046	456.2583	432.8220	418.4577	402.5325	401.5181	413.5611	425.6675	450.2312	465.2994	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5000	19.6403	0.3300	0.0000	0.7700	32.4388	(80)
North	5.4500	10.6334	0.3300	0.0000	0.7700	14.7256	(74)
West	8.1700	19.6403	0.3300	0.0000	0.7700	40.7731	(80)

Solar gains	87.9376	171.3595	283.6790	420.7973	525.0394	542.3190	514.2702	434.9651	331.8088	203.4390	109.4526	72.4819	(83)

Total gains	564.2950	661.9884	752.9836	877.0555	957.8614	960.7766	916.8027	836.4833	745.3699	629.1065	559.6838	537.7813	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.8180	63.8975	63.9756	64.3452	64.4149	64.7410	64.7410	64.8017	64.6150	64.4149	64.2742	64.1277	
alpha	5.2545	5.2598	5.2650	5.2897	5.2943	5.3161	5.3161	5.3201	5.3077	5.2943	5.2849	5.2752	
util living area	0.9984	0.9960	0.9885	0.9544	0.8549	0.6693	0.5016	0.5681	0.8341	0.9778	0.9964	0.9988	(86)
MIT	19.6481	19.8262	20.1100	20.5019	20.8112	20.9612	20.9930	20.9870	20.8780	20.4584	19.9823	19.6157	(87)
Th 2	19.9372	19.9384	19.9395	19.9450	19.9460	19.9507	19.9507	19.9516	19.9489	19.9460	19.9439	19.9418	(88)
util rest of house	0.9979	0.9946	0.9841	0.9363	0.8025	0.5750	0.3858	0.4460	0.7560	0.9657	0.9948	0.9983	(89)
MIT 2	18.7103	18.8886	19.1707	19.5531	19.8255	19.9346	19.9492	19.9483	19.8856	19.5195	19.0491	18.6815	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.0634	19.2417	19.5244	19.9104	20.1967	20.3212	20.3422	20.3394	20.2593	19.8730	19.4005	19.0333	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0634	19.2417	19.5244	19.9104	20.1967	20.3212	20.3422	20.3394	20.2593	19.8730	19.4005	19.0333	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9972	0.9932	0.9818	0.9356	0.8163	0.6097	0.4297	0.4924	0.7818	0.9646	0.9936	0.9978	(94)
Useful gains	562.7048	657.5164	739.2833	820.5969	781.9190	585.8333	393.9545	411.8696	582.7093	606.8361	556.1230	536.6004	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1587.1838	1539.9265	1396.7710	1174.0074	904.9974	606.3070	396.5830	417.0923	654.0060	987.6872	1313.0151	1586.9929	(97)
Space heating kWh	762.2124	592.9796	489.1708	254.4556	91.5703	0.0000	0.0000	0.0000	0.0000	283.3532	544.9623	781.4920	(98a)
Space heating requirement - total per year (kWh/year)												3800.1961	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	762.2124	592.9796	489.1708	254.4556	91.5703	0.0000	0.0000	0.0000	0.0000	283.3532	544.9623	781.4920	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3800.1961	
Space heating per m2											(98c) / (4) =	41.6597	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	996.1667	784.2163	804.6563	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8719	0.9309	0.8975	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	868.5721	730.0020	722.1707	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1075.0518	1026.0143	934.5234	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	148.6653	220.2332	157.9905	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.1663	55.0583	39.4976	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												131.7222	(107)
Energy for space heating												41.6597	(99)
Energy for space cooling												1.4440	(108)
Total												43.1037	(109)
Fabric Energy Efficiency (DFEE)												43.1	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		232.6110	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)

Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1290 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3790 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3221 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4107	0.4027	0.3946	0.3543	0.3463	0.3060	0.3060	0.2980	0.3221	0.3463	0.3624	0.3785	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)
Effective ac	0.5843 0.5811 0.5779 0.5628 0.5600 0.5468 0.5468 0.5444 0.5519 0.5600 0.5657 0.5716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.1200	1.1450	23.0382			(27)
Exposed Floor			91.2200	0.1300	11.8586			(28b)
Brickwork	61.0700	20.1200	40.9500	0.1800	7.3710			(29a)
Communal Wall	4.8500	2.0600	2.7900	0.1800	0.5022			(29a)
Stairwell Wall	18.1400		18.1400	0.1800	3.2652			(29a)
Total net area of external elements Aum(A, m2)			175.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.0952			(33)
Main dwelling								
Party Wall 1			32.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	270.7670 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	40.3600	0.0700	2.8252
E18 Party wall between dwellings	5.7000	0.0600	0.3420
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6500	0.0200	0.0530
E20 Exposed floor (normal)	20.3500	0.3200	6.5120
P7 Party Wall - Exposed floor (normal)	11.1600	0.1600	1.7856
E2 Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E4 Jamb	33.0000	0.0500	1.6500
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E21 Exposed floor (inverted)	8.6900	0.3200	2.7808
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	21.0231 (36)
Point Thermal bridges (36a) =	0.0000
Total fabric heat loss (33) + (36) + (36a) =	69.1183 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.8550	44.6036	44.3572	43.1997	42.9832	41.9751	41.9751	41.7884	42.3634	42.9832	43.4213	43.8792	(38)
Heat transfer coeff	113.9732	113.7218	113.4754	112.3180	112.1014	111.0934	111.0934	110.9067	111.4817	112.1014	112.5395	112.9975	(39)

Average = Sum(39)m / 12 =	112.3170

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2494	1.2467	1.2440	1.2313	1.2289	1.2179	1.2179	1.2158	1.2221	1.2289	1.2337	1.2387	(40)
HLP (average)												1.2313	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6421 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day)	65.3306 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2756	69.3203	67.1856	64.5287	62.1585	59.6952	59.1835	61.3139	63.4989	66.0284	68.7088	71.1756	(44)
Energy conte	112.8831	98.7112	103.2617	88.3366	83.6772	73.4022	71.5773	75.9194	78.3004	89.6000	97.8883	111.4438	(45)

Energy content (annual) Total = Sum(45)m =	1085.0013

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

95.9507	83.9045	87.7725	75.0861	71.1256	62.3919	60.8407	64.5315	66.5554	76.1600	83.2050	94.7272	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

95.9507	83.9045	87.7725	75.0861	71.1256	62.3919	60.8407	64.5315	66.5554	76.1600	83.2050	94.7272	(64)

												Total per year (kWh/year) = Sum(64)m =	922.2511 (64)
12Total per year (kWh/year)													922 (64)
Electric shower(s)													
	54.8717	48.8912	53.3873	50.9468	51.9028	49.5103	51.1606	51.9028	50.9468	53.3873	52.3834	54.8717	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		624.1629 (64a)
Heat gains from water heating, kWh/month													
	37.7056	33.1989	35.2899	31.5082	30.7571	27.9755	28.0003	29.1086	29.3756	32.3868	33.8971	37.3997	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)													
	50.6796	49.4031	47.4327	43.7614	41.3402	38.8549	37.6349	39.1244	40.7994	43.5307	47.0793	50.2685	(72)
Total internal gains													
	476.3575	490.6289	469.3046	456.2583	432.8220	418.4577	402.5325	401.5181	413.5611	425.6675	450.2312	465.2994	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.4500	10.6334	0.6300	0.7000	0.7700	17.7109	(74)
West	14.6700	19.6403	0.6300	0.7000	0.7700	88.0540	(80)

Solar gains	105.7649	206.0988	341.1884	506.1044	631.4792	652.2618	618.5268	523.1444	399.0755	244.6817	131.6417	87.1760	(83)
Total gains	582.1224	696.7276	810.4930	962.3626	1064.3012	1070.7195	1021.0593	924.6626	812.6366	670.3491	581.8728	552.4754	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.1978	60.3309	60.4619	61.0849	61.2029	61.7583	61.7583	61.8623	61.5432	61.2029	60.9647	60.7176	
alpha	5.0132	5.0221	5.0308	5.0723	5.0802	5.1172	5.1172	5.1242	5.1029	5.0802	5.0643	5.0478	
util living area													
	0.9982	0.9951	0.9854	0.9422	0.8268	0.6341	0.4729	0.5397	0.8124	0.9735	0.9958	0.9986	(86)
MIT	19.5662	19.7659	20.0810	20.5081	20.8231	20.9651	20.9935	20.9878	20.8812	20.4416	19.9293	19.5372	(87)
Th 2	19.8807	19.8828	19.8850	19.8951	19.8969	19.9057	19.9057	19.9074	19.9023	19.8969	19.8931	19.8891	(88)
util rest of house													
	0.9975	0.9933	0.9797	0.9201	0.7687	0.5385	0.3584	0.4178	0.7285	0.9593	0.9939	0.9981	(89)
MIT 2	18.5848	18.7852	19.0984	19.5150	19.7873	19.8918	19.9044	19.9044	19.8426	19.4627	18.9566	18.5624	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	18.9544	19.1545	19.4684	19.8889	20.1773	20.2959	20.3145	20.3124	20.2337	19.8313	19.3229	18.9294	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9544	19.1545	19.4684	19.8889	20.1773	20.2959	20.3145	20.3124	20.2337	19.8313	19.3229	18.9294	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9917	0.9770	0.9200	0.7849	0.5739	0.4018	0.4641	0.7566	0.9582	0.9926	0.9974	(94)
Useful gains	580.1955	690.9729	791.8668	885.3658	835.3268	614.5060	410.2630	429.0949	614.8126	642.3410	577.5470	551.0626	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1670.2048	1621.0528	1471.5952	1234.2566	950.3214	632.7811	412.6563	433.9124	683.7971	1034.8393	1375.5577	1664.3905	(97)
Space heating kWh													
	810.9669	625.0137	505.7179	251.2014	85.5560	0.0000	0.0000	0.0000	0.0000	292.0188	574.5678	828.3159	(98a)
Space heating requirement - total per year (kWh/year)												3973.3584	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	810.9669	625.0137	505.7179	251.2014	85.5560	0.0000	0.0000	0.0000	0.0000	292.0188	574.5678	828.3159	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3973.3584	
Space heating per m2											(98c) / (4) =	43.5580	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1044.2775	822.0908	842.8907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8897	0.9409	0.9101	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	929.1110	773.5112	767.1477	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1203.5564	1147.8727	1037.5901	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	197.6007	278.5249	201.2092	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													

0.0000	0.0000	0.0000	0.0000	0.0000	49.4002	69.6312	50.3023	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement											169.3337 (107)
Energy for space heating											43.5580 (99)
Energy for space cooling											1.8563 (108)
Total											45.4143 (109)
Fabric Energy Efficiency (TFEE)											45.4 (109)

Full SAP Calculation Printout

Plot Reference	P-12	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-12
Plot Address	Flat 3, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	77 C	**DER**	5.82	**TER**	14.18
Environmental	95 A	**% DER < TER**			58.96
CO_2 Emissions (t/year)	0.43	**DFEE**	43.10	**TFEE**	45.41
Compliance Check	See BREL	**% DFEE < TFEE**			5.09
% DPER < TPER	20.23	**DPER**	59.86	**TPER**	75.04

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	232.6110	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9500	(17)
Infiltration rate		0.1475	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

Effective ac	0.2959	0.2927	0.2896	0.2739	0.2708	0.2551	0.2551	0.2520	0.2614	0.2708	0.2770	0.2833	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Exposed Floor			91.2200	0.1082	9.8692	110.0000	10034.2000	(28b)
Brickwork	61.0700	20.1200	40.9500	0.2100	8.5995	110.0000	4504.5000	(29a)
Communal Wall	4.8500	2.0600	2.7900	0.2200	0.6138	110.0000	306.9000	(29a)
Stairwell Wall	18.1400		18.1400	0.2200	3.9908	110.0000	1995.3999	(29a)
Total net area of external elements Aum(A, m2)			175.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5835			(33)
Main dwelling								
Party Wall 1			32.6500	0.0000	0.0000	110.0000	3591.5002	(32)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			170.0300			9.0000	1530.2700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 24699.3700	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 270.7670 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	40.3600	0.0380	1.5337
E18	Party wall between dwellings	5.7000	0.0380	0.2166
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1600	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	2.6500	0.3300	0.8745
E20	Exposed floor (normal)	20.3500	0.1200	2.4420
P7	Party Wall - Exposed floor (normal)	11.1600	0.4800	5.3568
E2	Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E4	Jamb	33.0000	0.0160	0.5280
E16	Corner (normal)	11.4000	0.0540	0.6156
E17	Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E25	Staggered party wall between dwellings	2.8500	0.0310	0.0883
E21	Exposed floor (inverted)	8.6900	0.3200	2.7808
E5	Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.0979 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.6814 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.7102	22.4696	22.2290	21.0260	20.7854	19.5824	19.5824	19.3418	20.0636	20.7854	21.2666	21.7478	(38)
Heat transfer coeff	88.3916	88.1510	87.9104	86.7074	86.4668	85.2638	85.2638	85.0232	85.7450	86.4668	86.9480	87.4292	(39)
Average = Sum(39)m / 12 =												86.6473	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9690	0.9664	0.9637	0.9505	0.9479	0.9347	0.9347	0.9321	0.9400	0.9479	0.9532	0.9584	(40)
HLP (average)												0.9499	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)
Hot water usage for mixer showers

68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 128.5022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
										Total per year (kWh/year) = Sum(64)m =		2479.3192	(64)
12Total per year (kWh/year)												2479	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)	98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)
Total internal gains	524.6232	537.6181	513.3465	493.1932	465.5762	446.7964	427.8529	428.8508	443.3245	460.3566	491.7039	512.5981	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

West			6.5000	19.6403	0.3300	0.0000	0.7700				32.4388	(80)
North			5.4500	10.6334	0.3300	0.0000	0.7700				14.7256	(74)
West			8.1700	19.6403	0.3300	0.0000	0.7700				40.7731	(80)
Solar gains	87.9376	171.3595	283.6790	420.7973	525.0394	542.3190	514.2702	434.9651	331.8088	203.4390	109.4526	72.4819	(83)
Total gains	612.5607	708.9776	797.0255	913.9905	990.6155	989.1153	942.1231	863.8159	775.1333	663.7957	601.1565	585.0801	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.6198	77.8316	78.0446	79.1274	79.3476	80.4672	80.4672	80.6949	80.0156	79.3476	78.9085	78.4742	
alpha	6.1747	6.1888	6.2030	6.2752	6.2898	6.3645	6.3645	6.3797	6.3344	6.2898	6.2606	6.2316	
util living area	0.9974	0.9931	0.9789	0.9144	0.7591	0.5460	0.3975	0.4512	0.7254	0.9564	0.9936	0.9981	(86)
MIT	20.0155	20.1859	20.4368	20.7564	20.9404	20.9936	20.9993	20.9984	20.9664	20.6980	20.3025	19.9912	(87)
Th 2	20.1093	20.1115	20.1137	20.1248	20.1270	20.1381	20.1381	20.1403	20.1336	20.1270	20.1225	20.1181	(88)
util rest of house	0.9965	0.9908	0.9716	0.8881	0.7040	0.4751	0.3200	0.3678	0.6494	0.9370	0.9910	0.9974	(89)
MIT 2	18.9601	19.1787	19.4964	19.8881	20.0812	20.1348	20.1379	20.1398	20.1131	19.8312	19.3369	18.9358	(90)
Living area fraction									fLA = Living area / (4) =			0.3766	(91)
MIT	19.3576	19.5580	19.8505	20.2150	20.4047	20.4582	20.4622	20.4631	20.4344	20.1576	19.7005	19.3332	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3576	19.5580	19.8505	20.2150	20.4047	20.4582	20.4622	20.4631	20.4344	20.1576	19.7005	19.3332	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9889	0.9690	0.8911	0.7223	0.5017	0.3493	0.3992	0.6769	0.9378	0.9893	0.9965	(94)
Useful gains	609.8062	701.0758	772.3120	814.4853	715.5358	496.2734	329.0435	344.8619	524.7029	622.5227	594.7420	583.0544	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1330.9612	1292.1163	1173.6488	981.0986	752.6703	499.4910	329.3100	345.4615	543.1453	826.4188	1095.5887	1323.0879	(97)
Space heating kWh	536.5394	397.1792	298.5946	119.9616	27.6281	0.0000	0.0000	0.0000	0.0000	151.6987	360.6096	550.5849	(98a)
Space heating requirement - total per year (kWh/year)												2442.7961	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	536.5394	397.1792	298.5946	119.9616	27.6281	0.0000	0.0000	0.0000	0.0000	151.6987	360.6096	550.5849	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2442.7961	
Space heating per m2											(98c) / (4) =	26.7792	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	536.5394	397.1792	298.5946	119.9616	27.6281	0.0000	0.0000	0.0000	0.0000	151.6987	360.6096	550.5849	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	536.5394	397.1792	298.5946	119.9616	27.6281	0.0000	0.0000	0.0000	0.0000	151.6987	360.6096	550.5849	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601	(231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	2442.7961	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	685.5292	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	166.7239	(230a)
Total electricity for the above, kWh/year	166.7239	(231)
Electricity for lighting (calculated in Appendix L)	199.9782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3495.0275	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2442.7961	0.1565	382.3194	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			479.1020	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			531.0917	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2442.7961	1.5794	3858.1860	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	1.5220	1043.4058	(278)
Space and water heating			4901.5917	(279)
Pumps, fans and electric keep-hot	166.7239	1.5128	252.2200	(281)
Energy for lighting	199.9782	1.5338	306.7333	(282)
Total Primary energy kWh/year			5460.5450	(286)
Dwelling Primary energy Rate (DPER)			59.8600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.6110	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1290	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3790	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3221	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4107	0.4027	0.3946	0.3543	0.3463	0.3060	0.3060	0.2980	0.3221	0.3463	0.3624	0.3785 (22b)
Effective ac	0.5843	0.5811	0.5779	0.5628	0.5600	0.5468	0.5468	0.5444	0.5519	0.5600	0.5657	0.5716 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.1200	1.1450	23.0382			(27)
Exposed Floor			91.2200	0.1300	11.8586			(28b)
Brickwork	61.0700	20.1200	40.9500	0.1800	7.3710			(29a)
Communal Wall	4.8500	2.0600	2.7900	0.1800	0.5022			(29a)
Stairwell Wall	18.1400		18.1400	0.1800	3.2652			(29a)
Total net area of external elements Aum(A, m2)			175.2800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.0952			(33)
Main dwelling								
Party Wall 1			32.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	270.7670	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	40.3600	0.0700	2.8252
E18 Party wall between dwellings	5.7000	0.0600	0.3420
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6500	0.0200	0.0530
E20 Exposed floor (normal)	20.3500	0.3200	6.5120
P7 Party Wall - Exposed floor (normal)	11.1600	0.1600	1.7856
E2 Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E4 Jamb	33.0000	0.0500	1.6500
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E21 Exposed floor (inverted)	8.6900	0.3200	2.7808
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	21.0231	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	69.1183	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.8550	44.6036	44.3572	43.1997	42.9832	41.9751	41.9751	41.7884	42.3634	42.9832	43.4213	43.8792	(38)
Heat transfer coeff	113.9732	113.7218	113.4754	112.3180	112.1014	111.0934	111.0934	110.9067	111.4817	112.1014	112.5395	112.9975	(39)
Average = Sum(39)m / 12 =												112.3170	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2494	1.2467	1.2440	1.2313	1.2289	1.2179	1.2179	1.2158	1.2221	1.2289	1.2337	1.2387	(40)
HLP (average)												1.2313	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6421	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day)	128.5022	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)

Water storage loss (or HIU loss):		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.7527	(55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

267.9943	236.8998	251.2780	219.8328	212.3880	190.5938	187.4632	195.2989	197.8894	221.6191	236.8437	264.9107	(62)
WWHRS -31.3237	-27.7029	-29.0089	-24.0205	-22.3863	-19.1561	-17.9558	-19.0942	-19.8196	-23.3652	-26.4699	-30.7436	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

236.6706	209.1968	222.2690	195.8123	190.0017	171.4377	169.5074	176.2047	178.0697	198.2540	210.3738	234.1671	(64)
									Total per year (kWh/year) = Sum(64)m =		2391.9648	(64)
12Total per year (kWh/year)											2392	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

110.8912	98.4442	105.3330	94.1748	92.4021	84.4529	84.1146	86.7200	86.8786	95.4715	99.8310	109.8659	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)													
	149.0473	146.4944	141.5767	130.7984	124.1964	117.2957	113.0573	116.5591	120.6648	128.3219	138.6541	147.6693	(72)
Total internal gains													
	577.7252	590.7201	566.4486	546.2952	518.6782	496.8984	477.9549	478.9528	493.4265	513.4587	544.8060	565.7002	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.4500	10.6334	0.6300	0.7000	0.7700	17.7109	(74)
West	14.6700	19.6403	0.6300	0.7000	0.7700	88.0540	(80)

Solar gains	105.7649	206.0988	341.1884	506.1044	631.4792	652.2618	618.5268	523.1444	399.0755	244.6817	131.6417	87.1760	(83)
Total gains	683.4901	796.8189	907.6370	1052.3996	1150.1574	1149.1602	1096.4818	1002.0972	892.5020	758.1403	676.4476	652.8762	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.1978	60.3309	60.4619	61.0849	61.2029	61.7583	61.7583	61.8623	61.5432	61.2029	60.9647	60.7176	
alpha	5.0132	5.0221	5.0308	5.0723	5.0802	5.1172	5.1172	5.1242	5.1029	5.0802	5.0643	5.0478	
util living area													
	0.9962	0.9913	0.9769	0.9218	0.7919	0.5974	0.4418	0.5011	0.7684	0.9576	0.9918	0.9970	(86)
MIT	19.6745	19.8707	20.1765	20.5769	20.8567	20.9733	20.9952	20.9913	20.9091	20.5214	20.0287	19.6450	(87)
Th 2	19.8807	19.8828	19.8850	19.8951	19.8969	19.9057	19.9057	19.9074	19.9023	19.8969	19.8931	19.8891	(88)
util rest of house													
	0.9949	0.9882	0.9684	0.8943	0.7300	0.5046	0.3341	0.3863	0.6799	0.9367	0.9883	0.9959	(89)
MIT 2	18.3560	18.6071	18.9938	19.4851	19.7862	19.8923	19.9045	19.9048	19.8463	19.4334	18.8173	18.3243	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	18.8525	19.0829	19.4392	19.8962	20.1893	20.2994	20.3152	20.3139	20.2465	19.8431	19.2735	18.8216	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8525	19.0829	19.4392	19.8962	20.1893	20.2994	20.3152	20.3139	20.2465	19.8431	19.2735	18.8216	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9851	0.9641	0.8944	0.7477	0.5389	0.3748	0.4298	0.7099	0.9355	0.9856	0.9944	(94)
Useful gains	678.7473	784.9681	875.0208	941.2180	859.9396	619.3388	410.9963	430.6744	633.6290	709.2161	666.7087	649.2236	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1658.5942	1612.9055	1468.2790	1235.0742	951.6637	633.1614	412.7352	434.0769	685.2265	1036.1643	1369.9958	1652.2081	(97)
Space heating kWh													
	729.0061	556.3739	441.3841	211.5765	68.2427	0.0000	0.0000	0.0000	0.0000	243.2494	506.3667	746.2204	(98a)
Space heating requirement - total per year (kWh/year)												3502.4199	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	729.0061	556.3739	441.3841	211.5765	68.2427	0.0000	0.0000	0.0000	0.0000	243.2494	506.3667	746.2204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3502.4199	
Space heating per m2											(98c) / (4) =	38.3953	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	729.0061	556.3739	441.3841	211.5765	68.2427	0.0000	0.0000	0.0000	0.0000	243.2494	506.3667	746.2204	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	789.8224	602.7887	478.2060	229.2269	73.9358	0.0000	0.0000	0.0000	0.0000	263.5422	548.6097	808.4728	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	236.6706	209.1968	222.2690	195.8123	190.0017	171.4377	169.5074	176.2047	178.0697	198.2540	210.3738	234.1671	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4115	86.1451	85.5679	84.2338	81.9961	79.8000	79.8000	79.8000	79.8000	84.5196	85.9546	86.4706	(217)
Fuel for water heating, kWh/month													
	273.8878	242.8423	259.7576	232.4629	231.7205	214.8342	212.4152	220.8079	223.1450	234.5657	244.7498	270.8053	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)

Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.2957	20.2932	18.2717	13.3867	10.3402	8.4481	9.4327	12.2610	15.9258	20.8956	23.6015	25.9988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.1402	-35.6046	-53.5094	-62.9858	-70.3728	-66.5635	-65.7299	-60.8239	-52.6145	-41.9297	-27.0849	-20.6899	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2508	-19.8354	-40.1368	-61.3477	-82.1777	-82.9765	-82.0211	-68.9772	-49.9301	-28.7356	-12.4671	-7.2891	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3794.6045	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2861.9942	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.1510	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1127.1943	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5819.5554	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3794.6045	0.2100	796.8669	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.9942	0.2100	601.0188	(264)
Space and water heating			1397.8857	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.1510	0.1443	29.4653	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.0490	0.1337	-77.7943	
PV Unit electricity exported	-545.1453	0.1254	-68.3500	
Total			-146.1443	(269)
Total CO2, kg/year			1293.1360	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3794.6045	1.1300	4287.9031	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.9942	1.1300	3234.0534	(278)
Space and water heating			7521.9565	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.1510	1.5338	313.1336	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.0490	1.4939	-869.5328	
PV Unit electricity exported	-545.1453	0.4602	-250.8778	
Total			-1120.4106	(283)
Total Primary energy kWh/year			6844.7803	(286)
Target Primary Energy Rate (TPER)			75.0400	(287)

Full SAP Calculation Printout

Plot Reference	P-12	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-12
Plot Address	Flat 3, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	77 C	**DER**	5.82	**TER**	14.18
Environmental	95 A	**% DER < TER**			58.96
CO_2 Emissions (t/year)	0.43	**DFEE**	43.10	**TFEE**	45.41
Compliance Check	See BREL	**% DFEE < TFEE**			5.09
% DPER < TPER	20.23	**DPER**	59.86	**TPER**	75.04

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.6110	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9500 (17)
Infiltration rate		0.1475 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

Effective ac	0.2959	0.2927	0.2896	0.2739	0.2708	0.2551	0.2551	0.2520	0.2614	0.2708	0.2770	0.2833	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Exposed Floor			91.2200	0.1082	9.8692	110.0000	10034.2000	(28b)
Brickwork	61.0700	20.1200	40.9500	0.2100	8.5995	110.0000	4504.5000	(29a)
Communal Wall	4.8500	2.0600	2.7900	0.2200	0.6138	110.0000	306.9000	(29a)
Stairwell Wall	18.1400		18.1400	0.2200	3.9908	110.0000	1995.3999	(29a)
Total net area of external elements Aum(A, m2)			175.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5835			(33)
Main dwelling								
Party Wall 1			32.6500	0.0000	0.0000	110.0000	3591.5002	(32)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			170.0300			9.0000	1530.2700	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		24699.3700	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 270.7670 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	40.3600	0.0380	1.5337
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6500	0.3300	0.8745
E20 Exposed floor (normal)	20.3500	0.1200	2.4420
P7 Party Wall - Exposed floor (normal)	11.1600	0.4800	5.3568
E2 Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E4 Jamb	33.0000	0.0160	0.5280
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E21 Exposed floor (inverted)	8.6900	0.3200	2.7808
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.0979 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 65.6814 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.7102	22.4696	22.2290	21.0260	20.7854	19.5824	19.5824	19.3418	20.0636	20.7854	21.2666	21.7478	(38)
Heat transfer coeff	88.3916	88.1510	87.9104	86.7074	86.4668	85.2638	85.2638	85.0232	85.7450	86.4668	86.9480	87.4292	(39)

Average = Sum(39)m / 12 = 86.6473

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9690	0.9664	0.9637	0.9505	0.9479	0.9347	0.9347	0.9321	0.9400	0.9479	0.9532	0.9584	(40)
HLP (average)												0.9499	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 128.5022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
									Total per year (kWh/year) = Sum(64)m =			2479.3192	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.3090	25.1438	20.4483	15.4807	11.5720	9.7696	10.5564	13.7216	18.4170	23.3847	27.2934	29.0958	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	360.1558	363.8931	354.4752	334.4258	309.1169	285.3301	269.4391	265.7018	275.1196	295.1691	320.4780	344.2648	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)	98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)
Total internal gains	593.7455	591.7647	572.7336	536.9382	501.1187	468.6287	449.2861	452.2159	470.4349	503.1091	542.6589	577.2632	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

West			6.5000		19.6403		0.3300	0.0000		0.7700		32.4388 (80)
North			5.4500		10.6334		0.3300	0.0000		0.7700		14.7256 (74)
West			8.1700		19.6403		0.3300	0.0000		0.7700		40.7731 (80)
Solar gains	87.9376	171.3595	283.6790	420.7973	525.0394	542.3190	514.2702	434.9651	331.8088	203.4390	109.4526	72.4819 (83)
Total gains	681.6831	763.1242	856.4126	957.7355	1026.1581	1010.9477	963.5563	887.1810	802.2437	706.5481	652.1115	649.7452 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.6198	77.8316	78.0446	79.1274	79.3476	80.4672	80.4672	80.6949	80.0156	79.3476	78.9085	78.4742	
alpha	6.1747	6.1888	6.2030	6.2752	6.2898	6.3645	6.3645	6.3797	6.3344	6.2898	6.2606	6.2316	
util living area	0.9954	0.9899	0.9705	0.8986	0.7396	0.5348	0.3888	0.4395	0.7060	0.9432	0.9902	0.9965	(86)
MIT	20.0924	20.2443	20.4948	20.7847	20.9484	20.9943	20.9994	20.9986	20.9711	20.7341	20.3577	20.0636	(87)
Th 2	20.1093	20.1115	20.1137	20.1248	20.1270	20.1381	20.1381	20.1403	20.1336	20.1270	20.1225	20.1181	(88)
util rest of house	0.9939	0.9866	0.9608	0.8694	0.6840	0.4651	0.3129	0.3581	0.6301	0.9195	0.9863	0.9954	(89)
MIT 2	19.0581	19.2525	19.5671	19.9187	20.0878	20.1352	20.1379	20.1399	20.1162	19.8719	19.4064	19.0283	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.4476	19.6260	19.9165	20.2448	20.4119	20.4587	20.4623	20.4633	20.4381	20.1965	19.7646	19.4182	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4476	19.6260	19.9165	20.2448	20.4119	20.4587	20.4623	20.4633	20.4381	20.1965	19.7646	19.4182	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9843	0.9582	0.8738	0.7029	0.4913	0.3415	0.3888	0.6578	0.9217	0.9843	0.9941	(94)
Useful gains	676.4621	751.1177	820.6279	836.8687	721.2650	496.6726	329.0806	344.9577	527.6814	651.2474	641.8766	645.9044	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1338.9173	1298.1081	1179.4459	983.6820	753.2881	499.5332	329.3143	345.4723	543.4621	829.7807	1101.1647	1330.5111	(97)
Space heating kWh	492.8666	367.5775	266.9605	105.7056	23.8252	0.0000	0.0000	0.0000	0.0000	132.8288	330.6875	509.3473	(98a)
Space heating requirement - total per year (kWh/year)												2229.7991	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	492.8666	367.5775	266.9605	105.7056	23.8252	0.0000	0.0000	0.0000	0.0000	132.8288	330.6875	509.3473	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2229.7991	
Space heating per m2											(98c) / (4) =	24.4442	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	492.8666	367.5775	266.9605	105.7056	23.8252	0.0000	0.0000	0.0000	0.0000	132.8288	330.6875	509.3473	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	492.8666	367.5775	266.9605	105.7056	23.8252	0.0000	0.0000	0.0000	0.0000	132.8288	330.6875	509.3473	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601	(231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2229.7991	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	685.5292	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	166.7239	(230a)
Total electricity for the above, kWh/year	166.7239	(231)
Electricity for lighting (calculated in Appendix L)	199.9782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3282.0305	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2229.7991	16.4900	367.6939	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	16.4900	113.0438	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	166.7239	16.4900	27.4928	(249)
Energy for lighting	199.9782	16.4900	32.9764	(250)
Additional standing charges			0.0000	(251)
Total energy cost			541.2068	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.4303	(257)
SAP value		76.8150	
SAP rating (Section 12)		77	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2229.7991	0.1566	349.2776	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			446.0602	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			498.0499	(272)
CO2 emissions per m2			5.4600	(273)
EI value			95.1007	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	232.6110	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9500	(17)
Infiltration rate		0.1475	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1348	0.1285	0.1285	0.1191	0.1222	0.1066	0.1066	0.1034	0.1066	0.1191	0.1160	0.1254	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2708	0.2645	0.2645	0.2551	0.2582	0.2426	0.2426	0.2394	0.2426	0.2551	0.2520	0.2614	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Exposed Floor			91.2200	0.1082	9.8692	110.0000	10034.2000	(28b)
Brickwork	61.0700	20.1200	40.9500	0.2100	8.5995	110.0000	4504.5000	(29a)
Communal Wall	4.8500	2.0600	2.7900	0.2200	0.6138	110.0000	306.9000	(29a)
Stairwell Wall	18.1400		18.1400	0.2200	3.9908	110.0000	1995.3999	(29a)
Total net area of external elements Aum(A, m2)			175.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5835			(33)
Main dwelling								
Party Wall 1			32.6500	0.0000	0.0000	110.0000	3591.5002	(32)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			170.0300			9.0000	1530.2700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	24699.3700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		270.7670 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	40.3600	0.0380	1.5337
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6500	0.3300	0.8745
E20 Exposed floor (normal)	20.3500	0.1200	2.4420
P7 Party Wall - Exposed floor (normal)	11.1600	0.4800	5.3568
E2 Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E4 Jamb	33.0000	0.0160	0.5280
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E21 Exposed floor (inverted)	8.6900	0.3200	2.7808
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.0979 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	65.6814 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.7854	20.3042	20.3042	19.5824	19.8230	18.6200	18.6200	18.3794	18.6200	19.5824	19.3418	20.0636	(38)
Heat transfer coeff	86.4668	85.9856	85.9856	85.2638	85.5044	84.3014	84.3014	84.0608	84.3014	85.2638	85.0232	85.7450	(39)
Average = Sum(39)m / 12 =												85.1836	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9479	0.9426	0.9426	0.9347	0.9373	0.9242	0.9242	0.9215	0.9242	0.9347	0.9321	0.9400	(40)
HLP (average)												0.9338	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6421	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)
Hot water usage for baths	29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)
Hot water usage for other uses	41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)
Average daily hot water use (litres/day)												128.5022	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
										Total per year (kWh/year) = Sum(64)m =		2479.3192	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.3090	25.1438	20.4483	15.4807	11.5720	9.7696	10.5564	13.7216	18.4170	23.3847	27.2934	29.0958	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	360.1558	363.8931	354.4752	334.4258	309.1169	285.3301	269.4391	265.7018	275.1196	295.1691	320.4780	344.2648	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)													
	98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)
Total internal gains													
	593.7455	591.7647	572.7336	536.9382	501.1187	468.6287	449.2861	452.2159	470.4349	503.1091	542.6589	577.2632	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5000	23.8018	0.3300	0.0000	0.7700	39.3122	(80)
North	5.4500	12.7650	0.3300	0.0000	0.7700	17.6776	(74)
West	8.1700	23.8018	0.3300	0.0000	0.7700	49.4124	(80)

Solar gains	106.4022	181.3958	298.2196	448.6410	544.6268	594.6280	558.4928	484.9116	371.7364	231.2111	130.5174	88.1670	(83)
Total gains	700.1477	773.1605	870.9532	985.5792	1045.7455	1063.2567	1007.7789	937.1275	842.1713	734.3201	673.1763	665.4302	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3476	79.7917	79.7917	80.4672	80.2407	81.3858	81.3858	81.6187	81.3858	80.4672	80.6949	80.0156	
alpha	6.2898	6.3194	6.3194	6.3645	6.3494	6.4257	6.4257	6.4412	6.4257	6.3645	6.3797	6.3344	
util living area													
	0.9929	0.9854	0.9552	0.8461	0.6451	0.4115	0.2760	0.3049	0.5913	0.9027	0.9830	0.9945	(86)
MIT	20.2237	20.3669	20.6142	20.8711	20.9794	20.9990	20.9999	20.9999	20.9910	20.8316	20.4920	20.1976	(87)
Th 2	20.1270	20.1314	20.1314	20.1381	20.1359	20.1470	20.1470	20.1492	20.1470	20.1381	20.1403	20.1336	(88)
util rest of house													
	0.9905	0.9804	0.9407	0.8066	0.5828	0.3444	0.2047	0.2287	0.5117	0.8655	0.9762	0.9926	(89)
MIT 2	19.2390	19.4231	19.7274	20.0235	20.1223	20.1466	20.1470	20.1492	20.1426	19.9898	19.5891	19.2111	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.6098	19.7785	20.0613	20.3427	20.4451	20.4676	20.4682	20.4696	20.4621	20.3068	19.9291	19.5826	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6098	19.7785	20.0613	20.3427	20.4451	20.4676	20.4682	20.4696	20.4621	20.3068	19.9291	19.5826	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9886	0.9779	0.9393	0.8166	0.6056	0.3697	0.2315	0.2574	0.5416	0.8737	0.9741	0.9910	(94)
Useful gains	692.1415	756.0875	818.1125	804.8464	633.2902	393.0686	233.3475	241.1887	456.1019	641.5497	655.7675	659.4331	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1254.6168	1210.5472	1088.6900	890.3854	645.1390	393.4859	233.3623	241.2173	460.4630	750.8981	1014.2501	1241.8091	(97)
Space heating kWh													
	418.4816	305.3969	201.3096	61.5881	8.8156	0.0000	0.0000	0.0000	0.0000	81.3553	258.1075	433.2877	(98a)
Space heating requirement - total per year (kWh/year)												1768.3424	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	418.4816	305.3969	201.3096	61.5881	8.8156	0.0000	0.0000	0.0000	0.0000	81.3553	258.1075	433.2877	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1768.3424	
Space heating per m2											(98c) / (4) =	19.3855	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)

Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	418.4816	305.3969	201.3096	61.5881	8.8156	0.0000	0.0000	0.0000	0.0000	81.3553	258.1075	433.2877	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	418.4816	305.3969	201.3096	61.5881	8.8156	0.0000	0.0000	0.0000	0.0000	81.3553	258.1075	433.2877	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601	(231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1768.3424	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												685.5292	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												166.7239	(230a)
Total electricity for the above, kWh/year												166.7239	(231)
Electricity for lighting (calculated in Appendix L)												199.9782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2820.5738	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1768.3424	27.6700	489.3003	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	27.6700	189.6859	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	166.7239	27.6700	46.1325	(249)
Energy for lighting	199.9782	27.6700	55.3340	(250)
Additional standing charges			0.0000	(251)
Total energy cost			780.4528	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1768.3424	0.1575	278.5116	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			375.2942	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			427.2839	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1768.3424	1.5831	2799.3803	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)

Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	685.5292	1.5220	1043.4058 (278)
Space and water heating			3842.7860 (279)
Pumps, fans and electric keep-hot	166.7239	1.5128	252.2200 (281)
Energy for lighting	199.9782	1.5338	306.7333 (282)
Total Primary energy kWh/year			4401.7393 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 77
Current environmental impact rating: A 95

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: C 77
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£780	£780	£0
Space heating	£535	£535	£0
Water heating	£190	£190	£0
Lighting	£55	£55	£0
Total cost of fuels	£780	£780	£0
Total cost of uses	£780	£780	£0
Delivered energy	31 kWh/m²	31 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	48 kWh/m²	48 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	232.6110	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9500	(17)
Infiltration rate		0.1475	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1599	0.1567	0.1536	0.1379	0.1348	0.1191	0.1191	0.1160	0.1254	0.1348	0.1410	0.1473	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2959	0.2927	0.2896	0.2739	0.2708	0.2551	0.2551	0.2520	0.2614	0.2708	0.2770	0.2833	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Exposed Floor			91.2200	0.1082	9.8692	110.0000	10034.2000	(28b)
Brickwork	61.0700	20.1200	40.9500	0.2100	8.5995	110.0000	4504.5000	(29a)
Communal Wall	4.8500	2.0600	2.7900	0.2200	0.6138	110.0000	306.9000	(29a)
Stairwell Wall	18.1400		18.1400	0.2200	3.9908	110.0000	1995.3999	(29a)
Total net area of external elements Aum(A, m2)			175.2800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.5835			(33)
Main dwelling								
Party Wall 1			32.6500	0.0000	0.0000	110.0000	3591.5002	(32)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			170.0300			9.0000	1530.2700	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24699.3700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 270.7670 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	40.3600	0.0380	1.5337
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6500	0.3300	0.8745
E20 Exposed floor (normal)	20.3500	0.1200	2.4420
P7 Party Wall - Exposed floor (normal)	11.1600	0.4800	5.3568
E2 Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E4 Jamb	33.0000	0.0160	0.5280
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E21 Exposed floor (inverted)	8.6900	0.3200	2.7808
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.0979 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.6814 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.7102	22.4696	22.2290	21.0260	20.7854	19.5824	19.5824	19.3418	20.0636	20.7854	21.2666	21.7478	(38)
Heat transfer coeff	88.3916	88.1510	87.9104	86.7074	86.4668	85.2638	85.2638	85.0232	85.7450	86.4668	86.9480	87.4292	(39)

Average = Sum(39)m / 12 = 86.6473

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9690	0.9664	0.9637	0.9505	0.9479	0.9347	0.9347	0.9321	0.9400	0.9479	0.9532	0.9584	(40)
HLP (average)												0.9499	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)
Hot water usage for mixer showers

68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 128.5022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)

Total per year (kWh/year) = Sum(64)m = 2479.3192 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.3090	25.1438	20.4483	15.4807	11.5720	9.7696	10.5564	13.7216	18.4170	23.3847	27.2934	29.0958	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	360.1558	363.8931	354.4752	334.4258	309.1169	285.3301	269.4391	265.7018	275.1196	295.1691	320.4780	344.2648	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)													
	98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)
Total internal gains													
	593.7455	591.7647	572.7336	536.9382	501.1187	468.6287	449.2861	452.2159	470.4349	503.1091	542.6589	577.2632	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5000	19.6403	0.3300	0.0000	0.7700	32.4388	(80)
North	5.4500	10.6334	0.3300	0.0000	0.7700	14.7256	(74)
West	8.1700	19.6403	0.3300	0.0000	0.7700	40.7731	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	87.9376	171.3595	283.6790	420.7973	525.0394	542.3190	514.2702	434.9651	331.8088	203.4390	109.4526	72.4819	(83)
Total gains	681.6831	763.1242	856.4126	957.7355	1026.1581	1010.9477	963.5563	887.1810	802.2437	706.5481	652.1115	649.7452	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.6198	77.8316	78.0446	79.1274	79.3476	80.4672	80.4672	80.6949	80.0156	79.3476	78.9085	78.4742	
alpha	6.1747	6.1888	6.2030	6.2752	6.2898	6.3645	6.3645	6.3797	6.3344	6.2898	6.2606	6.2316	
util living area													
	0.9954	0.9899	0.9705	0.8986	0.7396	0.5348	0.3888	0.4395	0.7060	0.9432	0.9902	0.9965	(86)
MIT	20.0924	20.2443	20.4948	20.7847	20.9484	20.9943	20.9994	20.9986	20.9711	20.7341	20.3577	20.0636	(87)
Th 2	20.1093	20.1115	20.1137	20.1248	20.1270	20.1381	20.1381	20.1403	20.1336	20.1270	20.1225	20.1181	(88)
util rest of house													
	0.9939	0.9866	0.9608	0.8694	0.6840	0.4651	0.3129	0.3581	0.6301	0.9195	0.9863	0.9954	(89)
MIT 2	19.0581	19.2525	19.5671	19.9187	20.0878	20.1352	20.1379	20.1399	20.1162	19.8719	19.4064	19.0283	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.4476	19.6260	19.9165	20.2448	20.4119	20.4587	20.4623	20.4633	20.4381	20.1965	19.7646	19.4182	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4476	19.6260	19.9165	20.2448	20.4119	20.4587	20.4623	20.4633	20.4381	20.1965	19.7646	19.4182	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9843	0.9582	0.8738	0.7029	0.4913	0.3415	0.3888	0.6578	0.9217	0.9843	0.9941	(94)
Useful gains	676.4621	751.1177	820.6279	836.8687	721.2650	496.6726	329.0806	344.9577	527.6814	651.2474	641.8766	645.9044	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1338.9173	1298.1081	1179.4459	983.6820	753.2881	499.5332	329.3143	345.4723	543.4621	829.7807	1101.1647	1330.5111	(97)
Space heating kWh													
	492.8666	367.5775	266.9605	105.7056	23.8252	0.0000	0.0000	0.0000	0.0000	132.8288	330.6875	509.3473	(98a)
Space heating requirement - total per year (kWh/year)												2229.7991	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	492.8666	367.5775	266.9605	105.7056	23.8252	0.0000	0.0000	0.0000	0.0000	132.8288	330.6875	509.3473	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2229.7991	
Space heating per m2											(98c) / (4) =	24.4442	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	492.8666	367.5775	266.9605	105.7056	23.8252	0.0000	0.0000	0.0000	0.0000	132.8288	330.6875	509.3473	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	492.8666	367.5775	266.9605	105.7056	23.8252	0.0000	0.0000	0.0000	0.0000	132.8288	330.6875	509.3473	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
250.6944 221.2740 233.9780 203.0910 195.0881 173.8520 170.1633 177.9990 181.1475 204.3192 220.1018 247.6108 (64)
Efficiency of water heater 361.6650 (216)
(217)m 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 (217)
Fuel for water heating, kWh/month
69.3167 61.1820 64.6947 56.1544 53.9417 48.0699 47.0500 49.2165 50.0871 56.4941 60.8579 68.4641 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 14.1601 12.7898 14.1601 13.7033 14.1601 13.7033 14.1601 14.1601 13.7033 14.1601 13.7033 14.1601 (231)
Lighting 24.7787 19.8784 17.8983 13.1131 10.1289 8.2754 9.2399 12.0104 15.6003 20.4685 23.1191 25.4674 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 2229.7991 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 685.5292 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 166.7239 (230a)
Total electricity for the above, kWh/year 166.7239 (231)
Electricity for lighting (calculated in Appendix L) 199.9782 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 3282.0305 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2229.7991	16.4900	367.6939	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	16.4900	113.0438	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	166.7239	16.4900	27.4928	(249)
Energy for lighting	199.9782	16.4900	32.9764	(250)
Additional standing charges			0.0000	(251)
Total energy cost			541.2068	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.4303 (257)
SAP value 76.8150
SAP rating (Section 12) 77 (258)
SAP band C

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2229.7991	0.1566	349.2776	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			446.0602	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			498.0499	(272)
CO2 emissions per m2			5.4600	(273)
EI value			95.1007	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.6110	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9500 (17)
Infiltration rate		0.1475 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1254 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1348	0.1285	0.1285	0.1191	0.1222	0.1066	0.1066	0.1034	0.1066	0.1191	0.1160	0.1254	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2708	0.2645	0.2645	0.2551	0.2582	0.2426	0.2426	0.2394	0.2426	0.2551	0.2520	0.2614	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Exposed Floor			91.2200	0.1082	9.8692	110.0000	10034.2000	(28b)
Brickwork	61.0700	20.1200	40.9500	0.2100	8.5995	110.0000	4504.5000	(29a)
Communal Wall	4.8500	2.0600	2.7900	0.2200	0.6138	110.0000	306.9000	(29a)
Stairwell Wall	18.1400		18.1400	0.2200	3.9908	110.0000	1995.3999	(29a)
Total net area of external elements Aum(A, m2)			175.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5835			(33)
Main dwelling								
Party Wall 1			32.6500	0.0000	0.0000	110.0000	3591.5002	(32)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			170.0300			9.0000	1530.2700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 24699.3700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	270.7670 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	40.3600	0.0380	1.5337
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.6500	0.3300	0.8745
E20 Exposed floor (normal)	20.3500	0.1200	2.4420
P7 Party Wall - Exposed floor (normal)	11.1600	0.4800	5.3568
E2 Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E4 Jamb	33.0000	0.0160	0.5280
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883
E21 Exposed floor (inverted)	8.6900	0.3200	2.7808
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	17.0979 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 65.6814 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.7854	20.3042	20.3042	19.5824	19.8230	18.6200	18.6200	18.3794	18.6200	19.5824	19.3418	20.0636	(38)
Heat transfer coeff	86.4668	85.9856	85.9856	85.2638	85.5044	84.3014	84.3014	84.0608	84.3014	85.2638	85.0232	85.7450	(39)
Average = Sum(39)m / 12 =												85.1836	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9479	0.9426	0.9426	0.9347	0.9373	0.9242	0.9242	0.9215	0.9242	0.9347	0.9321	0.9400	(40)
HLP (average)												0.9338	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)

Hot water usage for mixer showers

68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 128.5022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)

Energy content (annual) Total = Sum(45)m = 2134.3942

Distribution loss (46)m = 0.15 x (45)m

33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)

Total per year (kWh/year) = Sum(64)m = 2479.3192 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

28.3090	25.1438	20.4483	15.4807	11.5720	9.7696	10.5564	13.7216	18.4170	23.3847	27.2934	29.0958	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

360.1558	363.8931	354.4752	334.4258	309.1169	285.3301	269.4391	265.7018	275.1196	295.1691	320.4780	344.2648	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)

Water heating gains (Table 5)

98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)

Total internal gains

593.7455	591.7647	572.7336	536.9382	501.1187	468.6287	449.2861	452.2159	470.4349	503.1091	542.6589	577.2632	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5000	23.8018	0.3300	0.0000	0.7700	39.3122	(80)
North	5.4500	12.7650	0.3300	0.0000	0.7700	17.6776	(74)
West	8.1700	23.8018	0.3300	0.0000	0.7700	49.4124	(80)

Solar gains	106.4022	181.3958	298.2196	448.6410	544.6268	594.6280	558.4928	484.9116	371.7364	231.2111	130.5174	88.1670	(83)
Total gains	700.1477	773.1605	870.9532	985.5792	1045.7455	1063.2567	1007.7789	937.1275	842.1713	734.3201	673.1763	665.4302	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3476	79.7917	79.7917	80.4672	80.2407	81.3858	81.3858	81.6187	81.3858	80.4672	80.6949	80.0156	
alpha	6.2898	6.3194	6.3194	6.3645	6.3494	6.4257	6.4257	6.4412	6.4257	6.3645	6.3797	6.3344	
util living area	0.9929	0.9854	0.9552	0.8461	0.6451	0.4115	0.2760	0.3049	0.5913	0.9027	0.9830	0.9945	(86)
MIT	20.2237	20.3669	20.6142	20.8711	20.9794	20.9990	20.9999	20.9999	20.9910	20.8316	20.4920	20.1976	(87)
Th 2	20.1270	20.1314	20.1314	20.1381	20.1359	20.1470	20.1470	20.1492	20.1470	20.1381	20.1403	20.1336	(88)
util rest of house	0.9905	0.9804	0.9407	0.8066	0.5828	0.3444	0.2047	0.2287	0.5117	0.8655	0.9762	0.9926	(89)
MIT 2	19.2390	19.4231	19.7274	20.0235	20.1223	20.1466	20.1470	20.1492	20.1426	19.9898	19.5891	19.2111	(90)

Living area fraction fLA = Living area / (4) = 0.3766 (91)

MIT	19.6098	19.7785	20.0613	20.3427	20.4451	20.4676	20.4682	20.4696	20.4621	20.3068	19.9291	19.5826	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6098	19.7785	20.0613	20.3427	20.4451	20.4676	20.4682	20.4696	20.4621	20.3068	19.9291	19.5826	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9886	0.9779	0.9393	0.8166	0.6056	0.3697	0.2315	0.2574	0.5416	0.8737	0.9741	0.9910	(94)
Useful gains	692.1415	756.0875	818.1125	804.8464	633.2902	393.0686	233.3475	241.1887	456.1019	641.5497	655.7675	659.4331	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1254.6168	1210.5472	1088.6900	890.3854	645.1390	393.4859	233.3623	241.2173	460.4630	750.8981	1014.2501	1241.8091	(97)
Space heating kWh	418.4816	305.3969	201.3096	61.5881	8.8156	0.0000	0.0000	0.0000	0.0000	81.3553	258.1075	433.2877	(98a)
Space heating requirement - total per year (kWh/year)												1768.3424	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	418.4816	305.3969	201.3096	61.5881	8.8156	0.0000	0.0000	0.0000	0.0000	81.3553	258.1075	433.2877	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1768.3424	
Space heating per m2											(98c) / (4) =	19.3855	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	418.4816	305.3969	201.3096	61.5881	8.8156	0.0000	0.0000	0.0000	0.0000	81.3553	258.1075	433.2877	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	418.4816	305.3969	201.3096	61.5881	8.8156	0.0000	0.0000	0.0000	0.0000	81.3553	258.1075	433.2877	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601	(231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1768.3424	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	685.5292	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	166.7239	(230a)
Total electricity for the above, kWh/year	166.7239	(231)
Electricity for lighting (calculated in Appendix L)	199.9782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2820.5738	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1768.3424	27.6700	489.3003	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	685.5292	27.6700	189.6859	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	166.7239	27.6700	46.1325	(249)
Energy for lighting	199.9782	27.6700	55.3340	(250)
Additional standing charges			0.0000	(251)
Total energy cost			780.4528	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1768.3424	0.1575	278.5116	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			375.2942	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			427.2839	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1768.3424	1.5831	2799.3803	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	1.5220	1043.4058	(278)
Space and water heating			3842.7860	(279)
Pumps, fans and electric keep-hot	166.7239	1.5128	252.2200	(281)
Energy for lighting	199.9782	1.5338	306.7333	(282)
Total Primary energy kWh/year			4401.7393	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-13	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-13
Plot Address	Flat 8, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.64	**TER**	14.40
Environmental	96 A	**% DER < TER**			60.83
CO_2 Emissions (t/year)	0.31	**DFEE**	41.36	**TFEE**	39.73
Compliance Check	See BREL	**% DFEE < TFEE**			-4.11
% DPER < TPER	24.02	**DPER**	58.08	**TPER**	76.44

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	27.17 m	66.96 m²	2.55 m

8.0 Living Area	31.28	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	70.84	46.65	0.00	None	24.19	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	16.81	16.81	0.50	Stairwell Access Corridor 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	33.42	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	131.12

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Terrace Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	5.79	5.79	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Summary for Input Data

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	61.17

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	30.24

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Brickwork	South	2.15	
Patio Door	Window-Red	Brickwork	East	6.50	
East	Window-Red	Brickwork	East	4.91	
Nort	Window	Brickwork	North	8.17	
South	Window-Red	Brickwork	South	2.46	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	44.04	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	8.64	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	8.64	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	2.88	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	20.82	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	10.21	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	37.80	0.02	0.02	RCD	Yes
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	3.65	0.33	0.33	Abbey Calculated	No
E15 Flat roof with parapet	Table K1 - Default	6.95	0.30	0.30		No
E25 Staggered party wall between dwellings	Gov Approved Scheme	8.64	0.03	0.03	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0

Summary for Input Data

elmhurst energy

Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.52	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	8
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

Summary for Input Data

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-13	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-13
Plot Address	Flat 8, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.64	**TER**	14.40
Environmental	96 A	**% DER < TER**			60.83
CO_2 Emissions (t/year)	0.31	**DFEE**	41.36	**TFEE**	39.73
Compliance Check	See BREL	**% DFEE < TFEE**			-4.11
% DPER < TPER	24.02	**DPER**	58.08	**TPER**	76.44

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

			Area		Storey height		Volume	
Main dwelling			(m2)		(m)		(m3)	
Ground floor			66.9600	(1b)	x 2.5500	(2b) =	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)		66.9600						(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

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2. Ventilation rate

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												m3 per hour	
Number of open chimneys											0 * 80 =	0.0000	(6a)
Number of open flues											0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000	(6d)
Number of flues attached to other heater											0 * 35 =	0.0000	(6e)
Number of blocked chimneys											0 * 20 =	0.0000	(6f)
Number of intermittent extract fans											0 * 10 =	0.0000	(7a)
Number of passive vents											0 * 10 =	0.0000	(7b)
Number of flueless gas fires											0 * 40 =	0.0000	(7c)
												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												2.5200	(17)
Infiltration rate												0.1260	(18)
Number of sides sheltered												2	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1071	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1366	0.1339	0.1312	0.1178	0.1151	0.1017	0.1017	0.0991	0.1071	0.1151	0.1205	0.1258	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2726	0.2699	0.2672	0.2538	0.2511	0.2377	0.2377	0.2351	0.2431	0.2511	0.2565	0.2618	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.8700	1.2357	17.1397			(27)
Brickwork	70.8400	24.1900	46.6500	0.2100	9.7965	110.0000	5131.4996	(29a)
Communal Wall	16.8100		16.8100	0.2200	3.6982	110.0000	1849.0999	(29a)
Terrace Roof	5.7900		5.7900	0.1300	0.7527	9.0000	52.1100	(30)
Total net area of external elements Aum(A, m2)			93.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.3221			(33)
Main dwelling								
Party Wall 1			33.4200	0.0000	0.0000	110.0000	3676.1998	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			61.1700			30.0000	1835.1000	(32b)
Internal Wall 1			131.1200			9.0000	1180.0800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15840.8893	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 236.5724 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	44.0400	0.0380	1.6735
E16 Corner (normal)	8.6400	0.0540	0.4666
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E15 Flat roof with parapet	6.9500	0.3000	2.0850
E25 Staggered party wall between dwellings	8.6400	0.0310	0.2678
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8281 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.1502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3575	15.2066	15.0557	14.3014	14.1505	13.3962	13.3962	13.2453	13.6979	14.1505	14.4523	14.7540	(38)
Heat transfer coeff	67.5076	67.3568	67.2059	66.4516	66.3007	65.5464	65.5464	65.3955	65.8481	66.3007	66.6024	66.9042	(39)

Average = Sum(39)m / 12 = 66.4138

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0082	1.0059	1.0037	0.9924	0.9902	0.9789	0.9789	0.9766	0.9834	0.9902	0.9947	0.9992	(40)
HLP (average)												0.9918	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)
Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)

Energy content (annual) Total = Sum(45)m = 1887.8373

Distribution loss (46)m = 0.15 x (45)m

29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)

Total per year (kWh/year) = Sum(64)m = 2232.7623 (64)
12Total per year (kWh/year) 2233 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8839	106.1572	95.8839	99.0800	95.8839	99.0800	95.8839	95.8839	99.0800	95.8839	99.0800	95.8839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains	429.0515	439.0397	419.4459	402.5261	380.1320	364.6692	349.3364	350.4609	362.2593	376.4184	402.1120	419.4449	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	10.6334	0.3300	0.0000	0.7700	22.0749	(74)

East			11.4100		19.6403		0.3100		0.0000		0.7700		53.4916 (76)
South			2.4600		46.7521		0.3100		0.0000		0.7700		27.4529 (78)
Solar gains	103.0194	191.7879	301.2854	431.2049	530.5777	546.2721	518.6400	442.4455	346.4410	222.8768	126.4710	86.1134	(83)
Total gains	532.0709	630.8276	720.7313	833.7311	910.7097	910.9413	867.9763	792.9064	708.7003	599.2952	528.5830	505.5583	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.1815	65.3275	65.4741	66.2174	66.3680	67.1318	67.1318	67.2867	66.8242	66.3680	66.0674	65.7694	
alpha	5.3454	5.3552	5.3649	5.4145	5.4245	5.4755	5.4755	5.4858	5.4549	5.4245	5.4045	5.3846	
util living area	0.9904	0.9763	0.9395	0.8284	0.6483	0.4569	0.3317	0.3782	0.6195	0.8970	0.9787	0.9925	(86)
MIT	19.9683	20.1945	20.4886	20.8046	20.9549	20.9944	20.9992	20.9984	20.9736	20.7380	20.2963	19.9290	(87)
Th 2	20.0765	20.0784	20.0803	20.0897	20.0915	20.1010	20.1010	20.1028	20.0972	20.0915	20.0878	20.0840	(88)
util rest of house	0.9876	0.9697	0.9238	0.7921	0.5938	0.3943	0.2642	0.3051	0.5468	0.8642	0.9716	0.9903	(89)
MIT 2	18.8869	19.1726	19.5355	19.9057	20.0570	20.0979	20.1007	20.1023	20.0809	19.8451	19.3109	18.8426	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	19.3921	19.6500	19.9807	20.3256	20.4765	20.5167	20.5204	20.5209	20.4979	20.2622	19.7712	19.3501	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3921	19.6500	19.9807	20.3256	20.4765	20.5167	20.5204	20.5209	20.4979	20.2622	19.7712	19.3501	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9849	0.9660	0.9218	0.8021	0.6174	0.4234	0.2958	0.3393	0.5798	0.8711	0.9686	0.9880	(94)
Useful gains	524.0511	609.4078	664.4037	668.7056	562.2859	385.7342	256.7394	269.0109	410.9180	522.0211	511.9989	499.5011	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1018.8295	993.5111	905.9853	759.2473	581.8864	387.8178	256.9701	269.4889	421.2895	640.6115	843.9336	1013.6054	(97)
Space heating kWh	368.1151	258.1174	179.7367	65.1900	14.5828	0.0000	0.0000	0.0000	0.0000	88.2313	238.9930	382.4936	(98a)
Space heating requirement - total per year (kWh/year)												1595.4598	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	368.1151	258.1174	179.7367	65.1900	14.5828	0.0000	0.0000	0.0000	0.0000	88.2313	238.9930	382.4936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1595.4598	
Space heating per m2										(98c) / (4) =		23.8271	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	368.1151	258.1174	179.7367	65.1900	14.5828	0.0000	0.0000	0.0000	0.0000	88.2313	238.9930	382.4936	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	368.1151	258.1174	179.7367	65.1900	14.5828	0.0000	0.0000	0.0000	0.0000	88.2313	238.9930	382.4936	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.3942	9.3883	10.3942	10.0589	10.3942	10.0589	10.3942	10.3942	10.0589	10.3942	10.0589	10.3942	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1595.4598	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	122.3836	(230a)
Total electricity for the above, kWh/year	122.3836	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2492.7017	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1595.4598	0.1570	250.4822	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			337.6131	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			377.3216	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1595.4598	1.5812	2522.7245	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	1.5219	939.5420	(278)
Space and water heating			3462.2665	(279)
Pumps, fans and electric keep-hot	122.3836	1.5128	185.1419	(281)
Energy for lighting	157.5018	1.5338	241.5815	(282)
Total Primary energy kWh/year			3888.9900	(286)
Dwelling Primary energy Rate (DPER)			58.0800	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.5500 (2b)	=	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1171	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3671	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3121	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.3979	0.3901	0.3823	0.3433	0.3355	0.2965	0.2965	0.2887	0.3121	0.3355	0.3511	0.3667	(22b)
Effective ac	0.5792	0.5761	0.5731	0.5589	0.5563	0.5439	0.5439	0.5417	0.5487	0.5563	0.5616	0.5672	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			14.5900	1.1450	16.7061			(27)
Brickwork	70.8400	16.7400	54.1000	0.1800	9.7380			(29a)
Communal Wall	16.8100		16.8100	0.1800	3.0258			(29a)
Terrace Roof	5.7900		5.7900	0.1100	0.6369			(30)
Total net area of external elements Aum(A, m2)			93.4400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.2568			(33)
Main dwelling								
Party Wall 1			33.4200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 236.5724 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	44.0400	0.0700	3.0828
E16 Corner (normal)	8.6400	0.0900	0.7776
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0900	-0.7776
E18 Party wall between dwellings	2.8800	0.0600	0.1728
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
E4 Jamb	37.8000	0.0500	1.8900
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.0200	0.0730
E15 Flat roof with parapet	6.9500	0.5600	3.8920
E25 Staggered party wall between dwellings	8.6400	0.0600	0.5184
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.0595 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 46.3163 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.6335	32.4603	32.2905	31.4932	31.3440	30.6495	30.6495	30.5209	30.9170	31.3440	31.6458	31.9613	(38)
Heat transfer coeff	78.9498	78.7766	78.6068	77.8095	77.6603	76.9658	76.9658	76.8372	77.2333	77.6603	77.9621	78.2776	(39)
Average = Sum(39)m / 12 =												77.8088	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1791	1.1765	1.1739	1.1620	1.1598	1.1494	1.1494	1.1475	1.1534	1.1598	1.1643	1.1690	(40)
HLP (average)												1.1620	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

	60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

	26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

	36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	242.4186	214.3957	227.6343	199.6478	193.2368	173.7866	171.1909	178.1211	180.2384	201.4005	214.6928	239.6911	(62)
WWHRS	-27.7063	-24.5036	-25.6588	-21.2465	-19.8010	-16.9438	-15.8821	-16.8891	-17.5307	-20.6668	-23.4130	-27.1932	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
										Total per year (kWh/year) = Sum(64)m =		2179.0197	(64)
12Total per year (kWh/year)												2179	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.3873	90.9616	97.4715	87.4633	86.0344	78.8645	78.7041	81.0084	81.0097	88.7488	92.4658	101.4804	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.9502	106.2306	95.9502	99.1486	95.9502	99.1486	95.9502	95.9502	99.1486	95.9502	99.1486	95.9502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	137.6173	135.3596	131.0101	121.4769	115.6376	109.5340	105.7851	108.8822	112.5135	119.2860	128.4247	136.3984	(72)
Total internal gains													
	482.2199	492.2152	472.6143	455.6967	433.3004	414.8398	399.5047	400.6293	412.4299	429.5868	455.2826	472.6133	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.4100	10.6334	0.6300	0.7000	0.7700	17.5809	(74)
East	7.5500	19.6403	0.6300	0.7000	0.7700	45.3175	(76)
South	1.6300	46.7521	0.6300	0.7000	0.7700	23.2895	(78)

Solar gains	86.1879	160.3909	251.6726	359.5413	441.7030	454.4408	431.5890	368.6620	289.1946	186.3255	105.7999	72.0475	(83)
Total gains	568.4078	652.6061	724.2869	815.2380	875.0034	869.2806	831.0937	769.2913	701.6245	615.9122	561.0825	544.6608	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.7348	55.8573	55.9779	56.5516	56.6602	57.1714	57.1714	57.2671	56.9734	56.6602	56.4409	56.2134	
alpha	4.7157	4.7238	4.7319	4.7701	4.7773	4.8114	4.8114	4.8178	4.7982	4.7773	4.7627	4.7476	
util living area													
	0.9891	0.9785	0.9539	0.8804	0.7394	0.5501	0.4042	0.4535	0.6983	0.9178	0.9785	0.9910	(86)
MIT	19.7426	19.9524	20.2529	20.6268	20.8744	20.9759	20.9955	20.9924	20.9282	20.5955	20.1086	19.7085	(87)
Th 2	19.9368	19.9389	19.9409	19.9505	19.9523	19.9607	19.9607	19.9622	19.9574	19.9523	19.9487	19.9449	(88)
util rest of house													
	0.9859	0.9722	0.9405	0.8479	0.6794	0.4676	0.3104	0.3542	0.6145	0.8874	0.9711	0.9883	(89)
MIT 2	18.4985	18.7643	19.1393	19.5897	19.8529	19.9476	19.9593	19.9596	19.9119	19.5674	18.9713	18.4610	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.0797	19.3193	19.6595	20.0742	20.3301	20.4280	20.4433	20.4421	20.3867	20.0477	19.5026	19.0437	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0797	19.3193	19.6595	20.0742	20.3301	20.4280	20.4433	20.4421	20.3867	20.0477	19.5026	19.0437	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9825	0.9676	0.9362	0.8522	0.7021	0.5054	0.3543	0.4007	0.6507	0.8906	0.9672	0.9853	(94)
Useful gains	558.4335	631.4645	678.0877	694.7383	614.3612	439.3604	294.4809	308.2256	456.5485	548.5452	542.6525	536.6287	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1166.8534	1135.9068	1034.4261	869.4570	670.2152	448.5544	295.8065	310.5809	485.5411	733.7105	966.9301	1161.9329	(97)
Space heating kWh													
	452.6644	338.9852	265.1158	125.7975	41.5554	0.0000	0.0000	0.0000	0.0000	137.7630	305.4799	465.2264	(98a)
Space heating requirement - total per year (kWh/year)												2132.5874	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	452.6644	338.9852	265.1158	125.7975	41.5554	0.0000	0.0000	0.0000	0.0000	137.7630	305.4799	465.2264	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2132.5874	
Space heating per m2											(98c) / (4) =	31.8487	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	452.6644	338.9852	265.1158	125.7975	41.5554	0.0000	0.0000	0.0000	0.0000	137.7630	305.4799	465.2264	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	490.4274	367.2646	287.2327	136.2919	45.0221	0.0000	0.0000	0.0000	0.0000	149.2556	330.9641	504.0372	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6907	85.3441	84.6708	83.2909	81.3945	79.8000	79.8000	79.8000	79.8000	83.4587	85.1042	85.7671	(217)
Fuel for water heating, kWh/month													
	250.5666	222.5017	238.5422	214.1905	213.0805	196.5449	194.6225	202.0451	203.8943	216.5546	224.7597	247.7617	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9366	15.9939	14.4007	10.5506	8.1496	6.6583	7.4343	9.6634	12.5518	16.4686	18.6013	20.4907	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.9732	-26.6465	-40.2582	-47.6579	-53.5010	-50.7181	-50.1044	-46.2525	-39.8280	-31.5154	-20.2201	-15.3905	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.5374	-14.0492	-28.4828	-43.6091	-58.4786	-59.0516	-58.3522	-49.0279	-35.4448	-20.3564	-8.8130	-5.1475 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2310.4956	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2625.0643	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	160.8995	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-827.4164	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4355.0429	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2310.4956	0.2100	485.2041	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2625.0643	0.2100	551.2635	(264)
Space and water heating			1036.4676	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.8995	0.1443	23.2228	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0658	0.1335	-58.7648	
PV Unit electricity exported	-387.3506	0.1253	-48.5501	
Total			-107.3150	(269)
Total CO2, kg/year			964.3046	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.4000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2310.4956	1.1300	2610.8600	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2625.0643	1.1300	2966.3226	(278)
Space and water heating			5577.1826	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.8995	1.5338	246.7930	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0658	1.4935	-657.2244	
PV Unit electricity exported	-387.3506	0.4601	-178.2022	
Total			-835.4265	(283)
Total Primary energy kWh/year			5118.6499	(286)
Target Primary Energy Rate (TPER)			76.4400	(287)

Full SAP Calculation Printout

Plot Reference	P-13	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-13
Plot Address	Flat 8, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.64	**TER**	14.40
Environmental	96 A	**% DER < TER**			60.83
CO_2 Emissions (t/year)	0.31	**DFEE**	41.36	**TFEE**	39.73
Compliance Check	See BREL	**% DFEE < TFEE**			-4.11
% DPER < TPER	24.02	**DPER**	58.08	**TPER**	76.44

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.5500	(2b) =	170.7480	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1171	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5200	(17)
Infiltration rate		0.2431	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2067	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2635	0.2583	0.2532	0.2273	0.2222	0.1963	0.1963	0.1912	0.2067	0.2222	0.2325	0.2428	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5347	0.5334	0.5320	0.5258	0.5247	0.5193	0.5193	0.5183	0.5214	0.5247	0.5270	0.5295	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.8700	1.2357	17.1397			(27)
Brickwork	70.8400	24.1900	46.6500	0.2100	9.7965	110.0000	5131.4996	(29a)
Communal Wall	16.8100		16.8100	0.2200	3.6982	110.0000	1849.0999	(29a)
Terrace Roof	5.7900		5.7900	0.1300	0.7527	9.0000	52.1100	(30)
Total net area of external elements Aum(A, m2)			93.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.3221			(33)
Main dwelling								
Party Wall 1			33.4200	0.0000	0.0000	110.0000	3676.1998	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			61.1700			30.0000	1835.1000	(32b)
Internal Wall 1			131.1200			9.0000	1180.0800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15840.8893	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							236.5724	(35)
List of Thermal Bridges								
K1 Element					Length	Psi-value	Total	

E7 Party floor between dwellings (in blocks of flats)	44.0400	0.0380	1.6735
E16 Corner (normal)	8.6400	0.0540	0.4666
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E15 Flat roof with parapet	6.9500	0.3000	2.0850
E25 Staggered party wall between dwellings	8.6400	0.0310	0.2678
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8281 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.1502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.1295	30.0535	29.9791	29.6294	29.5639	29.2594	29.2594	29.2030	29.3767	29.5639	29.6963	29.8347	(38)
Heat transfer coeff	82.2796	82.2037	82.1292	81.7795	81.7141	81.4095	81.4095	81.3531	81.5269	81.7141	81.8465	81.9848	(39)

Average = Sum(39)m / 12 = 81.7792

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2288	1.2277	1.2265	1.2213	1.2203	1.2158	1.2158	1.2150	1.2175	1.2203	1.2223	1.2244	(40)
HLP (average)												1.2213	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 57.7819 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.0397	61.3107	59.4229	57.0730	54.9768	52.7982	52.3454	54.2293	56.1616	58.3988	60.7695	62.9512	(44)
Energy conte	99.8395	87.3056	91.3308	78.1301	74.0093	64.9216	63.3072	67.1472	69.2529	79.2467	86.5774	98.5664	(45)

Energy content (annual) Total = Sum(45)m = 959.6345

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(64)

Total per year (kWh/year) = Sum(64)m = 815.6894 (64)

12Total per year (kWh/year) 816 (64)

Electric shower(s)

48.5348	43.2449	47.2218	45.0632	45.9088	43.7925	45.2523	45.9088	45.0632	47.2218	46.3339	48.5348	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 552.0809 (64a)

Heat gains from water heating, kWh/month

33.3496	29.3637	31.2132	27.8684	27.2042	24.7440	24.7658	25.7460	25.9820	28.6454	29.9812	33.0791	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8839	106.1572	95.8839	99.0800	95.8839	99.0800	95.8839	95.8839	99.0800	95.8839	99.0800	95.8839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	44.8247	43.6959	41.9533	38.7062	36.5647	34.3666	33.2874	34.6048	36.0862	38.5018	41.6405	44.4611	(72)
Total internal gains	386.3610	397.4781	380.4912	369.8575	351.1612	339.6038	326.9408	326.2855	335.9340	345.7363	365.4298	377.6096	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	10.6334	0.3300	0.0000	0.7700	22.0749	(74)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)
South	2.4600	46.7521	0.3100	0.0000	0.7700	27.4529	(78)

Solar gains	103.0194	191.7879	301.2854	431.2049	530.5777	546.2721	518.6400	442.4455	346.4410	222.8768	126.4710	86.1134	(83)
Total gains	489.3804	589.2660	681.7766	801.0624	881.7389	885.8759	845.5807	768.7310	682.3750	568.6131	491.9008	463.7230	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.4792	53.5286	53.5771	53.8062	53.8493	54.0508	54.0508	54.0882	53.9730	53.8493	53.7622	53.6715	
alpha	4.5653	4.5686	4.5718	4.5871	4.5900	4.6034	4.6034	4.6059	4.5982	4.5900	4.5841	4.5781	
util living area	0.9942	0.9861	0.9651	0.8957	0.7552	0.5660	0.4189	0.4776	0.7342	0.9415	0.9877	0.9954	(86)
MIT	19.5381	19.7768	20.1218	20.5513	20.8449	20.9676	20.9934	20.9883	20.8985	20.4812	19.9250	19.4903	(87)
Th 2	19.8970	19.8979	19.8988	19.9030	19.9038	19.9074	19.9074	19.9081	19.9060	19.9038	19.9022	19.9005	(88)
util rest of house	0.9924	0.9818	0.9542	0.8652	0.6942	0.4784	0.3173	0.3688	0.6483	0.9172	0.9832	0.9940	(89)
MIT 2	18.5831	18.8199	19.1574	19.5620	19.8076	19.8937	19.9058	19.9050	19.8549	19.5099	18.9717	18.5384	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.0292	19.2669	19.6079	20.0241	20.2922	20.3954	20.4139	20.4110	20.3424	19.9636	19.4171	18.9831	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0292	19.2669	19.6079	20.0241	20.2922	20.3954	20.4139	20.4110	20.3424	19.9636	19.4171	18.9831	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9904	0.9786	0.9507	0.8690	0.7171	0.5185	0.3649	0.4197	0.6848	0.9188	0.9806	0.9924	(94)
Useful gains	484.7039	576.6801	648.1693	696.1164	632.2943	459.3008	308.5279	322.6517	467.2739	522.4400	482.3374	460.1855	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1211.9138	1181.0124	1076.5447	909.7270	702.1027	471.7981	310.4864	326.3094	508.9210	765.1412	1008.1081	1211.9893	(97)
Space heating kWh	541.0441	406.1113	318.7114	153.7997	51.9375	0.0000	0.0000	0.0000	0.0000	180.5696	378.5549	559.3420	(98a)
Space heating requirement - total per year (kWh/year)												2590.0705	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	541.0441	406.1113	318.7114	153.7997	51.9375	0.0000	0.0000	0.0000	0.0000	180.5696	378.5549	559.3420	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2590.0705	
Space heating per m2										(98c) / (4) =		38.6809	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	765.2497	602.4306	618.2838	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9117	0.9520	0.9287	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	697.6830	573.5182	574.2112	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	999.6333	954.4135	866.4463	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	217.4042	283.3861	217.4229	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	54.3511	70.8465	54.3557	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												179.5533	(107)
Energy for space heating												38.6809	(99)
Energy for space cooling												2.6815	(108)
Total												41.3624	(109)
Fabric Energy Efficiency (DFEE)												41.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.5500	(2b) =	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		170.7480	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1171	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3671	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3121	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3979	0.3901	0.3823	0.3433	0.3355	0.2965	0.2965	0.2887	0.3121	0.3355	0.3511	0.3667	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5792	0.5761	0.5731	0.5589	0.5563	0.5439	0.5439	0.5417	0.5487	0.5563	0.5616	0.5672	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			14.5900	1.1450	16.7061			(27)
Brickwork	70.8400	16.7400	54.1000	0.1800	9.7380			(29a)
Communal Wall	16.8100		16.8100	0.1800	3.0258			(29a)
Terrace Roof	5.7900		5.7900	0.1100	0.6369			(30)
Total net area of external elements Aum(A, m2)			93.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.2568			(33)
Main dwelling								
Party Wall 1			33.4200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	236.5724	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	44.0400	0.0700	3.0828
E16 Corner (normal)	8.6400	0.0900	0.7776
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0900	-0.7776
E18 Party wall between dwellings	2.8800	0.0600	0.1728
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
E4 Jamb	37.8000	0.0500	1.8900
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.0200	0.0730
E15 Flat roof with parapet	6.9500	0.5600	3.8920
E25 Staggered party wall between dwellings	8.6400	0.0600	0.5184
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.0595	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 46.3163	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.6335	32.4603	32.2905	31.4932	31.3440	30.6495	30.6495	30.5209	30.9170	31.3440	31.6458	31.9613	(38)
Heat transfer coeff	78.9498	78.7766	78.6068	77.8095	77.6603	76.9658	76.9658	76.8372	77.2333	77.6603	77.9621	78.2776	(39)
Average = Sum(39)m / 12 =												77.8088	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1791	1.1765	1.1739	1.1620	1.1598	1.1494	1.1494	1.1475	1.1534	1.1598	1.1643	1.1690	(40)
HLP (average)												1.1620	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1701	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day)	57.7819	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.0397	61.3107	59.4229	57.0730	54.9768	52.7982	52.3454	54.2293	56.1616	58.3988	60.7695	62.9512	(44)
Energy conte	99.8395	87.3056	91.3308	78.1301	74.0093	64.9216	63.3072	67.1472	69.2529	79.2467	86.5774	98.5664	(45)

Energy content (annual)	Total = Sum(45)m =	959.6345

Distribution loss (46)m = 0.15 x (45)m

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(64)

Total per year (kWh/year) = Sum(64)m =	815.6894	(64)
12Total per year (kWh/year)	816	(64)

Electric shower(s)

48.5348	43.2449	47.2218	45.0632	45.9088	43.7925	45.2523	45.9088	45.0632	47.2218	46.3339	48.5348	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	552.0809	(64a)

Heat gains from water heating, kWh/month

	33.3496	29.3637	31.2132	27.8684	27.2042	24.7440	24.7658	25.7460	25.9820	28.6454	29.9812	33.0791 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	95.9502	106.2306	95.9502	99.1486	95.9502	99.1486	95.9502	95.9502	99.1486	95.9502	99.1486	95.9502 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048 (71)

Water heating gains (Table 5)

	44.8247	43.6959	41.9533	38.7062	36.5647	34.3666	33.2874	34.6048	36.0862	38.5018	41.6405	44.4611 (72)

Total internal gains

	386.4273	397.5516	380.5575	369.9260	351.2275	339.6724	327.0071	326.3519	336.0025	345.8026	365.4983	377.6760 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.4100	10.6334	0.6300	0.7000	0.7700	17.5809	(74)
East	7.5500	19.6403	0.6300	0.7000	0.7700	45.3175	(76)
South	1.6300	46.7521	0.6300	0.7000	0.7700	23.2895	(78)

Solar gains	86.1879	160.3909	251.6726	359.5413	441.7030	454.4408	431.5890	368.6620	289.1946	186.3255	105.7999	72.0475	(83)
Total gains	472.6152	557.9424	632.2301	729.4674	792.9305	794.1132	758.5961	695.0139	625.1972	532.1280	471.2982	449.7234	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.7348	55.8573	55.9779	56.5516	56.6602	57.1714	57.1714	57.2671	56.9734	56.6602	56.4409	56.2134	
alpha	4.7157	4.7238	4.7319	4.7701	4.7773	4.8114	4.8114	4.8178	4.7982	4.7773	4.7627	4.7476	
util living area	0.9949	0.9883	0.9716	0.9135	0.7862	0.5951	0.4413	0.4987	0.7556	0.9489	0.9892	0.9960	(86)
MIT	19.5896	19.8075	20.1254	20.5410	20.8350	20.9665	20.9935	20.9886	20.8989	20.4948	19.9705	19.5554	(87)
Th 2	19.9368	19.9389	19.9409	19.9505	19.9523	19.9607	19.9607	19.9622	19.9574	19.9523	19.9487	19.9449	(88)
util rest of house	0.9933	0.9847	0.9627	0.8871	0.7290	0.5086	0.3397	0.3911	0.6736	0.9275	0.9852	0.9947	(89)
MIT 2	18.6647	18.8820	19.1954	19.5956	19.8475	19.9461	19.9591	19.9591	19.9052	19.5639	19.0526	18.6369	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	19.0968	19.3143	19.6299	20.0373	20.3088	20.4228	20.4423	20.4400	20.3694	19.9988	19.4814	19.0660	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0968	19.3143	19.6299	20.0373	20.3088	20.4228	20.4423	20.4400	20.3694	19.9988	19.4814	19.0660	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9916	0.9820	0.9594	0.8895	0.7498	0.5481	0.3873	0.4415	0.7082	0.9286	0.9829	0.9932	(94)
Useful gains	468.6478	547.8796	606.5908	648.8896	594.5145	435.2418	293.7756	306.8549	442.7466	494.1525	463.2356	446.6866	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1168.2011	1135.5124	1032.0970	866.5845	668.5634	448.1561	295.7240	310.4239	484.2051	729.9114	965.2799	1163.6746	(97)
Space heating kWh	520.4677	394.8892	316.5766	156.7404	55.0923	0.0000	0.0000	0.0000	0.0000	175.4047	361.4719	533.4391	(98a)
Space heating requirement - total per year (kWh/year)												2514.0819	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	520.4677	394.8892	316.5766	156.7404	55.0923	0.0000	0.0000	0.0000	0.0000	175.4047	361.4719	533.4391	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2514.0819	
Space heating per m2											(98c) / (4) =	37.5460	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	723.4788	569.5471	583.9629	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9021	0.9473	0.9235	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	652.6432	539.5372	539.3165	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	892.3039	852.6719	780.2140	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	172.5557	232.9722	179.2277	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	43.1389	58.2431	44.8069	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												146.1889	(107)
Energy for space heating												37.5460	(99)
Energy for space cooling												2.1832	(108)

Total	39.7293 (109)
Fabric Energy Efficiency (TFEE)	39.7 (109)

Full SAP Calculation Printout

Plot Reference	P-13	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-13
Plot Address	Flat 8, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.64	**TER**	14.40
Environmental	96 A	**% DER < TER**			60.83
CO_2 Emissions (t/year)	0.31	**DFEE**	41.36	**TFEE**	39.73
Compliance Check	See BREL	**% DFEE < TFEE**			-4.11
% DPER < TPER	24.02	**DPER**	58.08	**TPER**	76.44

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

			Area		Storey height		Volume	
Main dwelling			(m2)		(m)		(m3)	
Ground floor			66.9600	(1b)	x 2.5500	(2b) =	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)		66.9600						(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

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2. Ventilation rate

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												m3 per hour	
Number of open chimneys											0 * 80 =	0.0000	(6a)
Number of open flues											0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000	(6d)
Number of flues attached to other heater											0 * 35 =	0.0000	(6e)
Number of blocked chimneys											0 * 20 =	0.0000	(6f)
Number of intermittent extract fans											0 * 10 =	0.0000	(7a)
Number of passive vents											0 * 10 =	0.0000	(7b)
Number of flueless gas fires											0 * 40 =	0.0000	(7c)
												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												2.5200	(17)
Infiltration rate												0.1260	(18)
Number of sides sheltered												2	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1071	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1366	0.1339	0.1312	0.1178	0.1151	0.1017	0.1017	0.0991	0.1071	0.1151	0.1205	0.1258	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2726	0.2699	0.2672	0.2538	0.2511	0.2377	0.2377	0.2351	0.2431	0.2511	0.2565	0.2618	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.8700	1.2357	17.1397			(27)
Brickwork	70.8400	24.1900	46.6500	0.2100	9.7965	110.0000	5131.4996	(29a)
Communal Wall	16.8100		16.8100	0.2200	3.6982	110.0000	1849.0999	(29a)
Terrace Roof	5.7900		5.7900	0.1300	0.7527	9.0000	52.1100	(30)
Total net area of external elements Aum(A, m2)			93.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.3221			(33)
Main dwelling								
Party Wall 1			33.4200	0.0000	0.0000	110.0000	3676.1998	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			61.1700			30.0000	1835.1000	(32b)
Internal Wall 1			131.1200			9.0000	1180.0800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15840.8893	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 236.5724 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	44.0400	0.0380	1.6735
E16 Corner (normal)	8.6400	0.0540	0.4666
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E15 Flat roof with parapet	6.9500	0.3000	2.0850
E25 Staggered party wall between dwellings	8.6400	0.0310	0.2678
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8281 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.1502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3575	15.2066	15.0557	14.3014	14.1505	13.3962	13.3962	13.2453	13.6979	14.1505	14.4523	14.7540	(38)
Heat transfer coeff	67.5076	67.3568	67.2059	66.4516	66.3007	65.5464	65.5464	65.3955	65.8481	66.3007	66.6024	66.9042	(39)

Average = Sum(39)m / 12 = 66.4138

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0082	1.0059	1.0037	0.9924	0.9902	0.9789	0.9789	0.9766	0.9834	0.9902	0.9947	0.9992	(40)
HLP (average)												0.9918	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)
Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)

Energy content (annual) Total = Sum(45)m = 1887.8373

Distribution loss (46)m = 0.15 x (45)m

29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)

Total per year (kWh/year) = Sum(64)m = 2232.7623 (64)
12Total per year (kWh/year) 2233 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8839	106.1572	95.8839	99.0800	95.8839	99.0800	95.8839	95.8839	99.0800	95.8839	99.0800	95.8839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains	429.0515	439.0397	419.4459	402.5261	380.1320	364.6692	349.3364	350.4609	362.2593	376.4184	402.1120	419.4449	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	10.6334	0.3300	0.0000	0.7700	22.0749	(74)

East			11.4100		19.6403		0.3100		0.0000		0.7700		53.4916 (76)
South			2.4600		46.7521		0.3100		0.0000		0.7700		27.4529 (78)
Solar gains	103.0194	191.7879	301.2854	431.2049	530.5777	546.2721	518.6400	442.4455	346.4410	222.8768	126.4710	86.1134	(83)
Total gains	532.0709	630.8276	720.7313	833.7311	910.7097	910.9413	867.9763	792.9064	708.7003	599.2952	528.5830	505.5583	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.1815	65.3275	65.4741	66.2174	66.3680	67.1318	67.1318	67.2867	66.8242	66.3680	66.0674	65.7694	
alpha	5.3454	5.3552	5.3649	5.4145	5.4245	5.4755	5.4755	5.4858	5.4549	5.4245	5.4045	5.3846	
util living area	0.9904	0.9763	0.9395	0.8284	0.6483	0.4569	0.3317	0.3782	0.6195	0.8970	0.9787	0.9925	(86)
MIT	19.9683	20.1945	20.4886	20.8046	20.9549	20.9944	20.9992	20.9984	20.9736	20.7380	20.2963	19.9290	(87)
Th 2	20.0765	20.0784	20.0803	20.0897	20.0915	20.1010	20.1010	20.1028	20.0972	20.0915	20.0878	20.0840	(88)
util rest of house	0.9876	0.9697	0.9238	0.7921	0.5938	0.3943	0.2642	0.3051	0.5468	0.8642	0.9716	0.9903	(89)
MIT 2	18.8869	19.1726	19.5355	19.9057	20.0570	20.0979	20.1007	20.1023	20.0809	19.8451	19.3109	18.8426	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	19.3921	19.6500	19.9807	20.3256	20.4765	20.5167	20.5204	20.5209	20.4979	20.2622	19.7712	19.3501	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3921	19.6500	19.9807	20.3256	20.4765	20.5167	20.5204	20.5209	20.4979	20.2622	19.7712	19.3501	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9849	0.9660	0.9218	0.8021	0.6174	0.4234	0.2958	0.3393	0.5798	0.8711	0.9686	0.9880	(94)
Useful gains	524.0511	609.4078	664.4037	668.7056	562.2859	385.7342	256.7394	269.0109	410.9180	522.0211	511.9989	499.5011	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1018.8295	993.5111	905.9853	759.2473	581.8864	387.8178	256.9701	269.4889	421.2895	640.6115	843.9336	1013.6054	(97)
Space heating kWh	368.1151	258.1174	179.7367	65.1900	14.5828	0.0000	0.0000	0.0000	0.0000	88.2313	238.9930	382.4936	(98a)
Space heating requirement - total per year (kWh/year)												1595.4598	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	368.1151	258.1174	179.7367	65.1900	14.5828	0.0000	0.0000	0.0000	0.0000	88.2313	238.9930	382.4936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1595.4598	
Space heating per m2										(98c) / (4) =		23.8271	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	368.1151	258.1174	179.7367	65.1900	14.5828	0.0000	0.0000	0.0000	0.0000	88.2313	238.9930	382.4936	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	368.1151	258.1174	179.7367	65.1900	14.5828	0.0000	0.0000	0.0000	0.0000	88.2313	238.9930	382.4936	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.3942	9.3883	10.3942	10.0589	10.3942	10.0589	10.3942	10.3942	10.0589	10.3942	10.0589	10.3942	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1595.4598	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	122.3836	(230a)
Total electricity for the above, kWh/year	122.3836	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2492.7017	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1595.4598	0.1570	250.4822	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			337.6131	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			377.3216	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1595.4598	1.5812	2522.7245	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	1.5219	939.5420	(278)
Space and water heating			3462.2665	(279)
Pumps, fans and electric keep-hot	122.3836	1.5128	185.1419	(281)
Energy for lighting	157.5018	1.5338	241.5815	(282)
Total Primary energy kWh/year			3888.9900	(286)
Dwelling Primary energy Rate (DPER)			58.0800	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.5500 (2b)	=	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1171	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3671	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3121	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.3979	0.3901	0.3823	0.3433	0.3355	0.2965	0.2965	0.2887	0.3121	0.3355	0.3511	0.3667	(22b)
Effective ac	0.5792	0.5761	0.5731	0.5589	0.5563	0.5439	0.5439	0.5417	0.5487	0.5563	0.5616	0.5672	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			14.5900	1.1450	16.7061			(27)
Brickwork	70.8400	16.7400	54.1000	0.1800	9.7380			(29a)
Communal Wall	16.8100		16.8100	0.1800	3.0258			(29a)
Terrace Roof	5.7900		5.7900	0.1100	0.6369			(30)
Total net area of external elements Aum(A, m2)			93.4400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.2568			(33)
Main dwelling								
Party Wall 1			33.4200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 236.5724 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	44.0400	0.0700	3.0828
E16 Corner (normal)	8.6400	0.0900	0.7776
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0900	-0.7776
E18 Party wall between dwellings	2.8800	0.0600	0.1728
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
E4 Jamb	37.8000	0.0500	1.8900
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.0200	0.0730
E15 Flat roof with parapet	6.9500	0.5600	3.8920
E25 Staggered party wall between dwellings	8.6400	0.0600	0.5184
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.0595 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 46.3163 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.6335	32.4603	32.2905	31.4932	31.3440	30.6495	30.6495	30.5209	30.9170	31.3440	31.6458	31.9613	(38)
Heat transfer coeff	78.9498	78.7766	78.6068	77.8095	77.6603	76.9658	76.9658	76.8372	77.2333	77.6603	77.9621	78.2776	(39)
Average = Sum(39)m / 12 =												77.8088	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1791	1.1765	1.1739	1.1620	1.1598	1.1494	1.1494	1.1475	1.1534	1.1598	1.1643	1.1690	(40)
HLP (average)												1.1620	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

	60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

	26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

	36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	242.4186	214.3957	227.6343	199.6478	193.2368	173.7866	171.1909	178.1211	180.2384	201.4005	214.6928	239.6911	(62)
WWHRS	-27.7063	-24.5036	-25.6588	-21.2465	-19.8010	-16.9438	-15.8821	-16.8891	-17.5307	-20.6668	-23.4130	-27.1932	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
										Total per year (kWh/year) = Sum(64)m =		2179.0197	(64)
12Total per year (kWh/year)												2179	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.3873	90.9616	97.4715	87.4633	86.0344	78.8645	78.7041	81.0084	81.0097	88.7488	92.4658	101.4804	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.9502	106.2306	95.9502	99.1486	95.9502	99.1486	95.9502	95.9502	99.1486	95.9502	99.1486	95.9502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	137.6173	135.3596	131.0101	121.4769	115.6376	109.5340	105.7851	108.8822	112.5135	119.2860	128.4247	136.3984	(72)
Total internal gains													
	482.2199	492.2152	472.6143	455.6967	433.3004	414.8398	399.5047	400.6293	412.4299	429.5868	455.2826	472.6133	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.4100	10.6334	0.6300	0.7000	0.7700	17.5809	(74)
East	7.5500	19.6403	0.6300	0.7000	0.7700	45.3175	(76)
South	1.6300	46.7521	0.6300	0.7000	0.7700	23.2895	(78)

Solar gains	86.1879	160.3909	251.6726	359.5413	441.7030	454.4408	431.5890	368.6620	289.1946	186.3255	105.7999	72.0475	(83)
Total gains	568.4078	652.6061	724.2869	815.2380	875.0034	869.2806	831.0937	769.2913	701.6245	615.9122	561.0825	544.6608	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.7348	55.8573	55.9779	56.5516	56.6602	57.1714	57.1714	57.2671	56.9734	56.6602	56.4409	56.2134	
alpha	4.7157	4.7238	4.7319	4.7701	4.7773	4.8114	4.8114	4.8178	4.7982	4.7773	4.7627	4.7476	
util living area													
	0.9891	0.9785	0.9539	0.8804	0.7394	0.5501	0.4042	0.4535	0.6983	0.9178	0.9785	0.9910	(86)
MIT	19.7426	19.9524	20.2529	20.6268	20.8744	20.9759	20.9955	20.9924	20.9282	20.5955	20.1086	19.7085	(87)
Th 2	19.9368	19.9389	19.9409	19.9505	19.9523	19.9607	19.9607	19.9622	19.9574	19.9523	19.9487	19.9449	(88)
util rest of house													
	0.9859	0.9722	0.9405	0.8479	0.6794	0.4676	0.3104	0.3542	0.6145	0.8874	0.9711	0.9883	(89)
MIT 2	18.4985	18.7643	19.1393	19.5897	19.8529	19.9476	19.9593	19.9596	19.9119	19.5674	18.9713	18.4610	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.0797	19.3193	19.6595	20.0742	20.3301	20.4280	20.4433	20.4421	20.3867	20.0477	19.5026	19.0437	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0797	19.3193	19.6595	20.0742	20.3301	20.4280	20.4433	20.4421	20.3867	20.0477	19.5026	19.0437	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9825	0.9676	0.9362	0.8522	0.7021	0.5054	0.3543	0.4007	0.6507	0.8906	0.9672	0.9853	(94)
Useful gains	558.4335	631.4645	678.0877	694.7383	614.3612	439.3604	294.4809	308.2256	456.5485	548.5452	542.6525	536.6287	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1166.8534	1135.9068	1034.4261	869.4570	670.2152	448.5544	295.8065	310.5809	485.5411	733.7105	966.9301	1161.9329	(97)
Space heating kWh													
	452.6644	338.9852	265.1158	125.7975	41.5554	0.0000	0.0000	0.0000	0.0000	137.7630	305.4799	465.2264	(98a)
Space heating requirement - total per year (kWh/year)												2132.5874	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	452.6644	338.9852	265.1158	125.7975	41.5554	0.0000	0.0000	0.0000	0.0000	137.7630	305.4799	465.2264	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2132.5874	
Space heating per m2											(98c) / (4) =	31.8487	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	452.6644	338.9852	265.1158	125.7975	41.5554	0.0000	0.0000	0.0000	0.0000	137.7630	305.4799	465.2264	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	490.4274	367.2646	287.2327	136.2919	45.0221	0.0000	0.0000	0.0000	0.0000	149.2556	330.9641	504.0372	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6907	85.3441	84.6708	83.2909	81.3945	79.8000	79.8000	79.8000	79.8000	83.4587	85.1042	85.7671	(217)
Fuel for water heating, kWh/month													
	250.5666	222.5017	238.5422	214.1905	213.0805	196.5449	194.6225	202.0451	203.8943	216.5546	224.7597	247.7617	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9366	15.9939	14.4007	10.5506	8.1496	6.6583	7.4343	9.6634	12.5518	16.4686	18.6013	20.4907	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.9732	-26.6465	-40.2582	-47.6579	-53.5010	-50.7181	-50.1044	-46.2525	-39.8280	-31.5154	-20.2201	-15.3905	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.5374	-14.0492	-28.4828	-43.6091	-58.4786	-59.0516	-58.3522	-49.0279	-35.4448	-20.3564	-8.8130	-5.1475 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2310.4956	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2625.0643	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	160.8995	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-827.4164	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4355.0429	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2310.4956	0.2100	485.2041	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2625.0643	0.2100	551.2635	(264)
Space and water heating			1036.4676	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.8995	0.1443	23.2228	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0658	0.1335	-58.7648	
PV Unit electricity exported	-387.3506	0.1253	-48.5501	
Total			-107.3150	(269)
Total CO2, kg/year			964.3046	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.4000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2310.4956	1.1300	2610.8600	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2625.0643	1.1300	2966.3226	(278)
Space and water heating			5577.1826	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.8995	1.5338	246.7930	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0658	1.4935	-657.2244	
PV Unit electricity exported	-387.3506	0.4601	-178.2022	
Total			-835.4265	(283)
Total Primary energy kWh/year			5118.6499	(286)
Target Primary Energy Rate (TPER)			76.4400	(287)

Full SAP Calculation Printout

Plot Reference	P-13	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-13
Plot Address	Flat 8, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.64	**TER**	14.40
Environmental	96 A	**% DER < TER**			60.83
CO_2 Emissions (t/year)	0.31	**DFEE**	41.36	**TFEE**	39.73
Compliance Check	See BREL	**% DFEE < TFEE**			-4.11
% DPER < TPER	24.02	**DPER**	58.08	**TPER**	76.44

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.5500	(2b) =	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	170.7480	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5200	(17)
Infiltration rate		0.1260	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1071	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1366	0.1339	0.1312	0.1178	0.1151	0.1017	0.1017	0.0991	0.1071	0.1151	0.1205	0.1258	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2726	0.2699	0.2672	0.2538	0.2511	0.2377	0.2377	0.2351	0.2431	0.2511	0.2565	0.2618	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.8700	1.2357	17.1397			(27)
Brickwork	70.8400	24.1900	46.6500	0.2100	9.7965	110.0000	5131.4996	(29a)
Communal Wall	16.8100		16.8100	0.2200	3.6982	110.0000	1849.0999	(29a)
Terrace Roof	5.7900		5.7900	0.1300	0.7527	9.0000	52.1100	(30)
Total net area of external elements Aum(A, m2)			93.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.3221			(33)
Main dwelling								
Party Wall 1			33.4200	0.0000	0.0000	110.0000	3676.1998	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			61.1700			30.0000	1835.1000	(32b)
Internal Wall 1			131.1200			9.0000	1180.0800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15840.8893 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 236.5724 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E7 Party floor between dwellings (in blocks of flats)	44.0400	0.0380	1.6735
	E16 Corner (normal)	8.6400	0.0540	0.4666
	E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
	E18 Party wall between dwellings	2.8800	0.0380	0.1094
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
	E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
	E4 Jamb	37.8000	0.0160	0.6048
	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
	E15 Flat roof with parapet	6.9500	0.3000	2.0850
	E25 Staggered party wall between dwellings	8.6400	0.0310	0.2678
	E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8281 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.1502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3575	15.2066	15.0557	14.3014	14.1505	13.3962	13.3962	13.2453	13.6979	14.1505	14.4523	14.7540	(38)
Heat transfer coeff	67.5076	67.3568	67.2059	66.4516	66.3007	65.5464	65.5464	65.3955	65.8481	66.3007	66.6024	66.9042	(39)

Average = Sum(39)m / 12 = 66.4138

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0082	1.0059	1.0037	0.9924	0.9902	0.9789	0.9789	0.9766	0.9834	0.9902	0.9947	0.9992	(40)
HLP (average)												0.9918	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)
Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
									Total per year (kWh/year) = Sum(64)m =		2232.7623	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	10.6334	0.3300	0.0000	0.7700	22.0749	(74)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)

South				2.4600		46.7521		0.3100		0.0000		0.7700	27.4529 (78)
Solar gains	103.0194	191.7879	301.2854	431.2049	530.5777	546.2721	518.6400	442.4455	346.4410	222.8768	126.4710	86.1134 (83)	
Total gains	590.1561	677.1182	771.1487	871.8274	942.3440	931.7759	888.4955	814.9469	733.6912	636.6071	572.3568	560.1319 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.1815	65.3275	65.4741	66.2174	66.3680	67.1318	67.1318	67.2867	66.8242	66.3680	66.0674	65.7694	
alpha	5.3454	5.3552	5.3649	5.4145	5.4245	5.4755	5.4755	5.4858	5.4549	5.4245	5.4045	5.3846	
util living area	0.9848	0.9683	0.9232	0.8080	0.6301	0.4471	0.3241	0.3681	0.6012	0.8760	0.9702	0.9881	(86)
MIT	20.0615	20.2628	20.5485	20.8283	20.9606	20.9949	20.9993	20.9986	20.9771	20.7726	20.3618	20.0179	(87)
Th 2	20.0765	20.0784	20.0803	20.0897	20.0915	20.1010	20.1010	20.1028	20.0972	20.0915	20.0878	20.0840	(88)
util rest of house	0.9805	0.9599	0.9045	0.7700	0.5760	0.3857	0.2582	0.2969	0.5296	0.8394	0.9609	0.9847	(89)
MIT 2	19.0042	19.2570	19.6055	19.9299	20.0616	20.0982	20.1007	20.1024	20.0832	19.8815	19.3914	18.9551	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	19.4981	19.7269	20.0460	20.3496	20.4816	20.5171	20.5205	20.5210	20.5008	20.2978	19.8447	19.4516	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4981	19.7269	20.0460	20.3496	20.4816	20.5171	20.5205	20.5210	20.5008	20.2978	19.8447	19.4516	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9772	0.9561	0.9038	0.7815	0.5997	0.4142	0.2890	0.3302	0.5622	0.8485	0.9579	0.9818	(94)
Useful gains	576.7130	647.3919	696.9364	681.2900	565.1199	385.9748	256.7688	269.0805	412.5076	540.1708	548.2698	549.9109	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1025.9870	998.6889	910.3732	760.8429	582.2242	387.8461	256.9738	269.4975	421.4777	642.9713	848.8272	1020.3936	(97)
Space heating kWh	334.2598	236.0715	158.7970	57.2781	12.7256	0.0000	0.0000	0.0000	0.0000	76.4835	216.4013	350.0392	(98a)
Space heating requirement - total per year (kWh/year)												1442.0561	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.2598	236.0715	158.7970	57.2781	12.7256	0.0000	0.0000	0.0000	0.0000	76.4835	216.4013	350.0392	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1442.0561	
Space heating per m2											(98c) / (4) =	21.5361	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.2598	236.0715	158.7970	57.2781	12.7256	0.0000	0.0000	0.0000	0.0000	76.4835	216.4013	350.0392	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	334.2598	236.0715	158.7970	57.2781	12.7256	0.0000	0.0000	0.0000	0.0000	76.4835	216.4013	350.0392	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.3942	9.3883	10.3942	10.0589	10.3942	10.0589	10.3942	10.3942	10.0589	10.3942	10.0589	10.3942	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1442.0561	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	122.3836	(230a)
Total electricity for the above, kWh/year	122.3836	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2339.2980	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1442.0561	16.4900	237.7951	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	16.4900	101.8021	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	122.3836	16.4900	20.1811	(249)
Energy for lighting	157.5018	16.4900	25.9720	(250)
Additional standing charges			0.0000	(251)
Total energy cost			385.7502	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2404	(257)
SAP value		79.8939	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1442.0561	0.1571	226.5570	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			313.6879	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			353.3964	(272)
CO2 emissions per m2			5.2800	(273)
EI value			95.7704	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b) x	2.5500	(2b) =	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 66.9600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		170.7480	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.5200	(17)
Infiltration rate	0.1260	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1071	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1151	0.1098	0.1098	0.1017	0.1044	0.0910	0.0910	0.0884	0.0910	0.1017	0.0991	0.1071	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2511	0.2458	0.2458	0.2377	0.2404	0.2270	0.2270	0.2244	0.2270	0.2377	0.2351	0.2431	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.8700	1.2357	17.1397			(27)
Brickwork	70.8400	24.1900	46.6500	0.2100	9.7965	110.0000	5131.4996	(29a)
Communal Wall	16.8100		16.8100	0.2200	3.6982	110.0000	1849.0999	(29a)
Terrace Roof	5.7900		5.7900	0.1300	0.7527	9.0000	52.1100	(30)
Total net area of external elements Aum(A, m2)			93.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.3221			(33)
Main dwelling								
Party Wall 1			33.4200	0.0000	0.0000	110.0000	3676.1998	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			61.1700			30.0000	1835.1000	(32b)
Internal Wall 1			131.1200			9.0000	1180.0800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15840.8893	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	236.5724	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	44.0400	0.0380	1.6735
E16 Corner (normal)	8.6400	0.0540	0.4666
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E15 Flat roof with parapet	6.9500	0.3000	2.0850
E25 Staggered party wall between dwellings	8.6400	0.0310	0.2678
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.8281	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 52.1502	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.1505	13.8488	13.8488	13.3962	13.5470	12.7927	12.7927	12.6418	12.7927	13.3962	13.2453	13.6979	(38)
Heat transfer coeff	66.3007	65.9990	65.9990	65.5464	65.6972	64.9429	64.9429	64.7920	64.9429	65.5464	65.3955	65.8481	(39)
Average = Sum(39)m / 12 =												65.4961	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9902	0.9856	0.9856	0.9789	0.9811	0.9699	0.9699	0.9676	0.9699	0.9789	0.9766	0.9834	(40)
HLP (average)												0.9781	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1701	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)
Hot water usage for baths	26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)
Hot water usage for other uses	36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)
Average daily hot water use (litres/day)												113.6581	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
									Total per year (kWh/year) = Sum(64)m =			2232.7623	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	12.7650	0.3300	0.0000	0.7700	26.5002	(74)
East	11.4100	23.8018	0.3100	0.0000	0.7700	64.8257	(76)
South	2.4600	54.2217	0.3100	0.0000	0.7700	31.8391	(78)

Solar gains	123.1650	200.8665	314.3041	457.8750	549.4175	598.4141	562.5335	491.7914	385.7309	250.8623	149.0582	103.4760	(83)
Total gains	610.3017	686.1968	784.1674	898.4975	961.1838	983.9179	932.3891	864.2928	772.9810	664.5925	594.9441	577.4944	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.3680	66.6715	66.6715	67.1318	66.9777	67.7557	67.7557	67.9134	67.7557	67.1318	67.2867	66.8242	
alpha	5.4245	5.4448	5.4448	5.4755	5.4652	5.5170	5.5170	5.5276	5.5170	5.4755	5.4858	5.4549	
util living area	0.9776	0.9574	0.8958	0.7446	0.5437	0.3426	0.2298	0.2548	0.4983	0.8168	0.9530	0.9822	(86)
MIT	20.2111	20.3910	20.6633	20.8989	20.9834	20.9989	20.9999	20.9999	20.9923	20.8620	20.5104	20.1716	(87)
Th 2	20.0915	20.0953	20.0953	20.1010	20.0991	20.1085	20.1085	20.1104	20.1085	20.1010	20.1028	20.0972	(88)
util rest of house	0.9714	0.9462	0.8714	0.6999	0.4868	0.2842	0.1678	0.1882	0.4269	0.7685	0.9385	0.9770	(89)
MIT 2	19.2040	19.4291	19.7530	20.0127	20.0879	20.1081	20.1085	20.1104	20.1045	19.9834	19.5856	19.1593	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	19.6744	19.8785	20.1782	20.4267	20.5063	20.5242	20.5249	20.5259	20.5192	20.3938	20.0176	19.6322	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6744	19.8785	20.1782	20.4267	20.5063	20.5242	20.5249	20.5259	20.5192	20.3938	20.0176	19.6322	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9679	0.9430	0.8738	0.7167	0.5128	0.3115	0.1967	0.2193	0.4601	0.7853	0.9368	0.9738	(94)
Useful gains	590.6852	647.0970	685.2437	643.9385	492.8888	306.4651	183.4395	189.5404	355.6467	521.8784	557.3718	562.3454	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	966.2956	935.7637	843.3507	689.9858	499.7096	306.8060	183.4583	189.5742	358.4352	582.9577	785.8995	956.9173	(97)
Space heating kWh	279.4542	193.9840	117.6316	33.1541	5.0747	0.0000	0.0000	0.0000	0.0000	45.4431	164.5399	293.5615	(98a)
Space heating requirement - total per year (kWh/year)												1132.8430	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	279.4542	193.9840	117.6316	33.1541	5.0747	0.0000	0.0000	0.0000	0.0000	45.4431	164.5399	293.5615	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1132.8430	
Space heating per m2											(98c) / (4) =	16.9182	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Space heating requirement
279.4542 193.9840 117.6316 33.1541 5.0747 0.0000 0.0000 0.0000 0.0000 45.4431 164.5399 293.5615 (98)
Space heating efficiency (main heating system 1)
100.0000 100.0000 100.0000 100.0000 0.0000 0.0000 0.0000 0.0000 100.0000 100.0000 100.0000 (210)
Space heating fuel (main heating system)
279.4542 193.9840 117.6316 33.1541 5.0747 0.0000 0.0000 0.0000 0.0000 45.4431 164.5399 293.5615 (211)
Space heating efficiency (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (212)
Space heating fuel (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (213)
Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
225.1187 198.7700 210.3344 182.9060 175.9369 157.0448 153.8910 160.8212 163.4966 184.1006 197.9510 222.3912 (64)
Efficiency of water heater 361.6650 (216)
(217)m 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 (217)
Fuel for water heating, kWh/month
62.2451 54.9597 58.1572 50.5733 48.6464 43.4227 42.5507 44.4669 45.2066 50.9036 54.7332 61.4909 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 10.3942 9.3883 10.3942 10.0589 10.3942 10.0589 10.3942 10.3942 10.0589 10.3942 10.0589 10.3942 (231)
Lighting 19.5156 15.6561 14.0966 10.3278 7.9775 6.5177 7.2773 9.4593 12.2867 16.1209 18.2085 20.0580 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 1132.8430 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 617.3565 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 122.3836 (230a)
Total electricity for the above, kWh/year 122.3836 (231)
Electricity for lighting (calculated in Appendix L) 157.5018 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2030.0849 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1132.8430	27.6700	313.4576	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	27.6700	170.8225	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	122.3836	27.6700	33.8635	(249)
Energy for lighting	157.5018	27.6700	43.5808	(250)
Additional standing charges			0.0000	(251)
Total energy cost			561.7245	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1132.8430	0.1579	178.8733	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			266.0042	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			305.7127	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1132.8430	1.5845	1794.9924	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	1.5219	939.5420	(278)
Space and water heating			2734.5344	(279)
Pumps, fans and electric keep-hot	122.3836	1.5128	185.1419	(281)

Energy for lighting	157.5018	1.5338	241.5815 (282)
Total Primary energy kWh/year			3161.2578 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 80
Current environmental impact rating: A 96

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 80
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£562	£562	£0
Space heating	£347	£347	£0
Water heating	£171	£171	£0
Lighting	£44	£44	£0
Total cost of fuels	£562	£562	£0
Total cost of uses	£562	£562	£0
Delivered energy	30 kWh/m²	30 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	47 kWh/m²	47 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.5500 (2b)	=	170.7480 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	170.7480	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5200 (17)
Infiltration rate		0.1260 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1071 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1366	0.1339	0.1312	0.1178	0.1151	0.1017	0.1017	0.0991	0.1071	0.1151	0.1205	0.1258	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2726	0.2699	0.2672	0.2538	0.2511	0.2377	0.2377	0.2351	0.2431	0.2511	0.2565	0.2618 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.1500	1.2000	2.5800			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.8700	1.2357	17.1397			(27)
Brickwork	70.8400	24.1900	46.6500	0.2100	9.7965	110.0000	5131.4996	(29a)
Communal Wall	16.8100		16.8100	0.2200	3.6982	110.0000	1849.0999	(29a)
Terrace Roof	5.7900		5.7900	0.1300	0.7527	9.0000	52.1100	(30)
Total net area of external elements Aum(A, m2)			93.4400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.3221			(33)
Main dwelling								
Party Wall 1			33.4200	0.0000	0.0000	110.0000	3676.1998	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			61.1700			30.0000	1835.1000	(32b)
Internal Wall 1			131.1200			9.0000	1180.0800	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15840.8893 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 236.5724 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	44.0400	0.0380	1.6735
E16 Corner (normal)	8.6400	0.0540	0.4666
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E15 Flat roof with parapet	6.9500	0.3000	2.0850
E25 Staggered party wall between dwellings	8.6400	0.0310	0.2678
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8281 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.1502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3575	15.2066	15.0557	14.3014	14.1505	13.3962	13.3962	13.2453	13.6979	14.1505	14.4523	14.7540	(38)
Heat transfer coeff	67.5076	67.3568	67.2059	66.4516	66.3007	65.5464	65.5464	65.3955	65.8481	66.3007	66.6024	66.9042	(39)
Average = Sum(39)m / 12 =												66.4138	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0082	1.0059	1.0037	0.9924	0.9902	0.9789	0.9789	0.9766	0.9834	0.9902	0.9947	0.9992	(40)
HLP (average)												0.9918	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)
Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
										Total per year (kWh/year) = Sum(64)m =		2232.7623	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)

Water heating gains (Table 5)

	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)

Total internal gains

	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	10.6334	0.3300	0.0000	0.7700	22.0749	(74)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)
South	2.4600	46.7521	0.3100	0.0000	0.7700	27.4529	(78)

Solar gains	103.0194	191.7879	301.2854	431.2049	530.5777	546.2721	518.6400	442.4455	346.4410	222.8768	126.4710	86.1134	(83)
Total gains	590.1561	677.1182	771.1487	871.8274	942.3440	931.7759	888.4955	814.9469	733.6912	636.6071	572.3568	560.1319	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.1815	65.3275	65.4741	66.2174	66.3680	67.1318	67.1318	67.2867	66.8242	66.3680	66.0674	65.7694	
alpha	5.3454	5.3552	5.3649	5.4145	5.4245	5.4755	5.4755	5.4858	5.4549	5.4245	5.4045	5.3846	
util living area	0.9848	0.9683	0.9232	0.8080	0.6301	0.4471	0.3241	0.3681	0.6012	0.8760	0.9702	0.9881	(86)
MIT	20.0615	20.2628	20.5485	20.8283	20.9606	20.9949	20.9993	20.9986	20.9771	20.7726	20.3618	20.0179	(87)
Th 2	20.0765	20.0784	20.0803	20.0897	20.0915	20.1010	20.1010	20.1028	20.0972	20.0915	20.0878	20.0840	(88)
util rest of house	0.9805	0.9599	0.9045	0.7700	0.5760	0.3857	0.2582	0.2969	0.5296	0.8394	0.9609	0.9847	(89)
MIT 2	19.0042	19.2570	19.6055	19.9299	20.0616	20.0982	20.1007	20.1024	20.0832	19.8815	19.3914	18.9551	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	19.4981	19.7269	20.0460	20.3496	20.4816	20.5171	20.5205	20.5210	20.5008	20.2978	19.8447	19.4516	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4981	19.7269	20.0460	20.3496	20.4816	20.5171	20.5205	20.5210	20.5008	20.2978	19.8447	19.4516	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9772	0.9561	0.9038	0.7815	0.5997	0.4142	0.2890	0.3302	0.5622	0.8485	0.9579	0.9818	(94)
Useful gains	576.7130	647.3919	696.9364	681.2900	565.1199	385.9748	256.7688	269.0805	412.5076	540.1708	548.2698	549.9109	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1025.9870	998.6889	910.3732	760.8429	582.2242	387.8461	256.9738	269.4975	421.4777	642.9713	848.8272	1020.3936	(97)
Space heating kWh	334.2598	236.0715	158.7970	57.2781	12.7256	0.0000	0.0000	0.0000	0.0000	76.4835	216.4013	350.0392	(98a)
Space heating requirement - total per year (kWh/year)												1442.0561	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.2598	236.0715	158.7970	57.2781	12.7256	0.0000	0.0000	0.0000	0.0000	76.4835	216.4013	350.0392	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1442.0561	
Space heating per m2											(98c) / (4) =	21.5361	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.2598	236.0715	158.7970	57.2781	12.7256	0.0000	0.0000	0.0000	0.0000	76.4835	216.4013	350.0392	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	334.2598	236.0715	158.7970	57.2781	12.7256	0.0000	0.0000	0.0000	0.0000	76.4835	216.4013	350.0392	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating

Water heating requirement

	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.3942	9.3883	10.3942	10.0589	10.3942	10.0589	10.3942	10.3942	10.0589	10.3942	10.0589	10.3942	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1442.0561	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	122.3836	(230a)
Total electricity for the above, kWh/year	122.3836	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2339.2980	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1442.0561	16.4900	237.7951	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	16.4900	101.8021	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	122.3836	16.4900	20.1811	(249)
Energy for lighting	157.5018	16.4900	25.9720	(250)
Additional standing charges			0.0000	(251)
Total energy cost			385.7502	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2404	(257)
SAP value		79.8939	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1442.0561	0.1571	226.5570	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			313.6879	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			353.3964	(272)
CO2 emissions per m2			5.2800	(273)
EI value			95.7704	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.5500	(2b) =	170.7480	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		170.7480	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5200	(17)
Infiltration rate		0.1260	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1071	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1151	0.1098	0.1098	0.1017	0.1044	0.0910	0.0910	0.0884	0.0910	0.1017	0.0991	0.1071	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2511	0.2458	0.2458	0.2377	0.2404	0.2270	0.2270	0.2244	0.2270	0.2377	0.2351	0.2431	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			8.1700	1.1450	9.3550			(27)
Window-Red			13.8700	1.2357	17.1397			(27)
Brickwork	70.8400	24.1900	46.6500	0.2100	9.7965	110.0000	5131.4996	(29a)
Communal Wall	16.8100		16.8100	0.2200	3.6982	110.0000	1849.0999	(29a)
Terrace Roof	5.7900		5.7900	0.1300	0.7527	9.0000	52.1100	(30)
Total net area of external elements Aum(A, m2)			93.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.3221			(33)
Main dwelling								
Party Wall 1			33.4200	0.0000	0.0000	110.0000	3676.1998	(32)
Party Floor 1			30.2400			70.0000	2116.8000	(32d)
Party Ceiling 1			61.1700			30.0000	1835.1000	(32b)
Internal Wall 1			131.1200			9.0000	1180.0800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15840.8893	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	236.5724	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	44.0400	0.0380	1.6735
E16 Corner (normal)	8.6400	0.0540	0.4666
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.2100	0.0500	0.5105
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E15 Flat roof with parapet	6.9500	0.3000	2.0850
E25 Staggered party wall between dwellings	8.6400	0.0310	0.2678
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.8281 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.1502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.1505	13.8488	13.8488	13.3962	13.5470	12.7927	12.7927	12.6418	12.7927	13.3962	13.2453	13.6979	(38)
Heat transfer coeff	66.3007	65.9990	65.9990	65.5464	65.6972	64.9429	64.9429	64.7920	64.9429	65.5464	65.3955	65.8481	(39)
Average = Sum(39)m / 12 =												65.4961	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9902	0.9856	0.9856	0.9789	0.9811	0.9699	0.9699	0.9676	0.9699	0.9789	0.9766	0.9834	(40)
HLP (average)												0.9781	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.1701 (42)
Hot water usage for mixer showers		

	60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)
Hot water usage for baths													
	26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)
Hot water usage for other uses													
	36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)
Average daily hot water use (litres/day)												113.6581	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m													
	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
										Total per year (kWh/year) = Sum(64)m =		2232.7623	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains													
	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.1700	12.7650	0.3300	0.0000	0.7700	26.5002	(74)
East	11.4100	23.8018	0.3100	0.0000	0.7700	64.8257	(76)
South	2.4600	54.2217	0.3100	0.0000	0.7700	31.8391	(78)

Solar gains	123.1650	200.8665	314.3041	457.8750	549.4175	598.4141	562.5335	491.7914	385.7309	250.8623	149.0582	103.4760	(83)
Total gains	610.3017	686.1968	784.1674	898.4975	961.1838	983.9179	932.3891	864.2928	772.9810	664.5925	594.9441	577.4944	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.3680	66.6715	66.6715	67.1318	66.9777	67.7557	67.7557	67.9134	67.7557	67.1318	67.2867	66.8242	
alpha	5.4245	5.4448	5.4448	5.4755	5.4652	5.5170	5.5170	5.5276	5.5170	5.4755	5.4858	5.4549	
util living area													
	0.9776	0.9574	0.8958	0.7446	0.5437	0.3426	0.2298	0.2548	0.4983	0.8168	0.9530	0.9822	(86)
MIT	20.2111	20.3910	20.6633	20.8989	20.9834	20.9989	20.9999	20.9999	20.9923	20.8620	20.5104	20.1716	(87)
Th 2	20.0915	20.0953	20.0953	20.1010	20.0991	20.1085	20.1085	20.1104	20.1085	20.1010	20.1028	20.0972	(88)
util rest of house													
	0.9714	0.9462	0.8714	0.6999	0.4868	0.2842	0.1678	0.1882	0.4269	0.7685	0.9385	0.9770	(89)
MIT 2	19.2040	19.4291	19.7530	20.0127	20.0879	20.1081	20.1085	20.1104	20.1045	19.9834	19.5856	19.1593	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	19.6744	19.8785	20.1782	20.4267	20.5063	20.5242	20.5249	20.5259	20.5192	20.3938	20.0176	19.6322	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6744	19.8785	20.1782	20.4267	20.5063	20.5242	20.5249	20.5259	20.5192	20.3938	20.0176	19.6322	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9679	0.9430	0.8738	0.7167	0.5128	0.3115	0.1967	0.2193	0.4601	0.7853	0.9368	0.9738	(94)
Useful gains	590.6852	647.0970	685.2437	643.9385	492.8888	306.4651	183.4395	189.5404	355.6467	521.8784	557.3718	562.3454	(95)

Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	966.2956	935.7637	843.3507	689.9858	499.7096	306.8060	183.4583	189.5742	358.4352	582.9577	785.8995	956.9173	(97)
Space heating kWh	279.4542	193.9840	117.6316	33.1541	5.0747	0.0000	0.0000	0.0000	0.0000	45.4431	164.5399	293.5615	(98a)
Space heating requirement - total per year (kWh/year)												1132.8430	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	279.4542	193.9840	117.6316	33.1541	5.0747	0.0000	0.0000	0.0000	0.0000	45.4431	164.5399	293.5615	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1132.8430	
Space heating per m2											(98c) / (4) =	16.9182	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	279.4542	193.9840	117.6316	33.1541	5.0747	0.0000	0.0000	0.0000	0.0000	45.4431	164.5399	293.5615	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	279.4542	193.9840	117.6316	33.1541	5.0747	0.0000	0.0000	0.0000	0.0000	45.4431	164.5399	293.5615	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.3942	9.3883	10.3942	10.0589	10.3942	10.0589	10.3942	10.3942	10.0589	10.3942	10.0589	10.3942	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1132.8430	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	122.3836	(230a)
Total electricity for the above, kWh/year	122.3836	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2030.0849	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1132.8430	27.6700	313.4576	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	27.6700	170.8225	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	122.3836	27.6700	33.8635	(249)
Energy for lighting	157.5018	27.6700	43.5808	(250)
Additional standing charges			0.0000	(251)
Total energy cost			561.7245	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1132.8430	0.1579	178.8733	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			266.0042	(265)
Pumps, fans and electric keep-hot	122.3836	0.1387	16.9761	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			305.7127	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1132.8430	1.5845	1794.9924	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	1.5219	939.5420	(278)
Space and water heating			2734.5344	(279)
Pumps, fans and electric keep-hot	122.3836	1.5128	185.1419	(281)
Energy for lighting	157.5018	1.5338	241.5815	(282)
Total Primary energy kWh/year			3161.2578	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-14	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-14
Plot Address	Flat 9, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.00	**TER**	14.95
Environmental	97 A	**% DER < TER**			66.56
CO_2 Emissions (t/year)	0.21	**DFEE**	36.26	**TFEE**	36.85
Compliance Check	See BREL	**% DFEE < TFEE**			1.61
% DPER < TPER	35.01	**DPER**	51.75	**TPER**	79.63

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	269.69	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	18.56 m	52.35 m²	2.55 m

8.0 Living Area	23.96	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	31.41	19.48	0.00	None	11.93	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	18.11	16.05	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Smoke Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	3.93	3.93	0.60	Stairwell Access Corridor 2	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	34.94	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	91.44

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Terrace Roof	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	5.93	5.93	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	46.42

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	52.35

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-RED	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	South	2.06	
Patio Door	Window-RED	Brickwork	East	6.50	
East	Window-RED	Brickwork	East	5.42	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	26.31	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	5.76	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.88	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	8.64	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	24.26	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	5.98	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	13.69	0.02	0.02	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	3.65	0.33	0.33	Abbey Calculated	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.88	0.03	0.03	RCD	No
E15 Flat roof with parapet	Table K1 - Default	6.82	0.30	0.30		No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value	0.13	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0

Summary for Input Data

elmhurst energy

Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.56	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	6
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains

Summary for Input Data

Bath Count	1	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-14	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-14
Plot Address	Flat 9, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.00	**TER**	14.95
Environmental	97 A	**% DER < TER**			66.56
CO_2 Emissions (t/year)	0.21	**DFEE**	36.26	**TFEE**	36.85
Compliance Check	See BREL	**% DFEE < TFEE**			1.61
% DPER < TPER	35.01	**DPER**	51.75	**TPER**	79.63

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.3500	(1b)	x 2.5500	(2b) =	133.4925	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.3500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.4925	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5600	(17)
Infiltration rate		0.1280	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1088	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1387	0.1360	0.1333	0.1197	0.1170	0.1034	0.1034	0.1006	0.1088	0.1170	0.1224	0.1278	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2747	0.2720	0.2693	0.2557	0.2530	0.2394	0.2394	0.2366	0.2448	0.2530	0.2584	0.2638	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2200	0.8646	110.0000	432.3000	(29a)
Terrace Roof	5.9300		5.9300	0.1400	0.8302	9.0000	53.3700	(30)
Total net area of external elements Aum(A, m2)			59.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5207			(33)
Main dwelling								
Party Wall 1			34.9400	0.0000	0.0000	110.0000	3843.3998	(32)
Party Floor 1			52.3500			70.0000	3664.5000	(32d)
Party Ceiling 1			46.4200			30.0000	1392.6000	(32b)
Internal Wall 1			91.4400			9.0000	822.9600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14118.5299 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 269.6949 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.3100	0.0380	0.9998
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.2600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9800	0.0500	0.2990
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E15 Flat roof with parapet	6.8200	0.3000	2.0460
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.9616 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.4823 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.1021	11.9823	11.8625	11.2633	11.1435	10.5444	10.5444	10.4246	10.7841	11.1435	11.3832	11.6228	(38)
Heat transfer coeff	46.5844	46.4646	46.3448	45.7457	45.6259	45.0268	45.0268	44.9069	45.2664	45.6259	45.8655	46.1052	(39)

Average = Sum(39)m / 12 = 45.7157

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8899	0.8876	0.8853	0.8738	0.8716	0.8601	0.8601	0.8578	0.8647	0.8716	0.8761	0.8807	(40)
HLP (average)												0.8733	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7594 (42)

Hot water usage for mixer showers

53.7188	52.9115	51.7351	49.4843	47.8233	45.9709	44.9181	46.0855	47.3653	49.3542	51.6533	53.5130	(42a)

Hot water usage for baths

23.2241	22.8792	22.3934	21.4979	20.8273	20.0837	19.6821	20.1644	20.6896	21.4852	22.3992	23.1456	(42b)

Hot water usage for other uses

32.6480	31.4608	30.2736	29.0864	27.8992	26.7120	26.7120	27.8992	29.0864	30.2736	31.4608	32.6480	(42c)

Average daily hot water use (litres/day) 100.7393 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.5908	107.2514	104.4021	100.0686	96.5498	92.7667	91.3122	94.1491	97.1412	101.1130	105.5133	109.3065	(44)
Energy conte	173.5651	152.7246	160.4622	136.9889	129.9746	114.0674	110.4341	116.5763	119.7849	137.2093	150.3230	171.1475	(45)

Energy content (annual) Total = Sum(45)m = 1673.2580

Distribution loss (46)m = 0.15 x (45)m

26.0348	22.9087	24.0693	20.5483	19.4962	17.1101	16.5651	17.4864	17.9677	20.5814	22.5485	25.6721	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(64)

Total per year (kWh/year) = Sum(64)m = 2018.1830 (64)

12Total per year (kWh/year) 2018 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.7104	50.7809	53.3537	45.5488	43.2165	37.9274	36.7193	38.7616	39.8285	45.6221	49.9824	56.9066	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3233	85.6079	77.3233	79.9007	77.3233	79.9007	77.3233	77.3233	79.9007	77.3233	79.9007	77.3233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.3335	154.9247	150.9151	142.3792	131.6041	121.4771	114.7116	113.1205	117.1300	125.6660	136.4410	146.5681	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	(71)
Water heating gains (Table 5)	77.5677	75.5669	71.7119	63.2622	58.0868	52.6770	49.3540	52.0989	55.3173	61.3200	69.4200	76.4873	(72)
Total internal gains	357.6155	365.4904	349.3412	334.9330	316.4051	303.4457	290.7798	291.9336	301.7390	313.7002	335.1527	349.7696	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	19.6403	0.3100	0.0000	0.7700	55.8825	(76)

Solar gains	55.8825	109.3181	180.0313	262.5649	321.7831	329.4023	313.6044	269.3816	209.3838	129.7151	69.6789	45.9551	(83)
Total gains	413.4980	474.8084	529.3725	597.4979	638.1882	632.8480	604.3842	561.3152	511.1228	443.4153	404.8316	395.7246	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	84.1872	84.4043	84.6225	85.7308	85.9559	87.0996	87.0996	87.3320	86.6385	85.9559	85.5068	85.0624	
alpha	6.6125	6.6270	6.6415	6.7154	6.7304	6.8066	6.8066	6.8221	6.7759	6.7304	6.7005	6.6708	
util living area	0.9928	0.9815	0.9481	0.8348	0.6500	0.4542	0.3277	0.3678	0.6025	0.8982	0.9820	0.9944	(86)
MIT	20.2586	20.4306	20.6565	20.8893	20.9807	20.9985	20.9999	20.9997	20.9911	20.8457	20.5146	20.2299	(87)
Th 2	20.1761	20.1781	20.1800	20.1898	20.1917	20.2015	20.2015	20.2035	20.1976	20.1917	20.1878	20.1839	(88)
util rest of house	0.9905	0.9758	0.9334	0.7991	0.5986	0.3981	0.2683	0.3042	0.5362	0.8649	0.9756	0.9926	(89)
MIT 2	19.3217	19.5395	19.8176	20.0886	20.1777	20.2008	20.2015	20.2034	20.1925	20.0511	19.6549	19.2915	(90)
Living area fraction									fLA = Living area / (4) =			0.4577	(91)
MIT	19.7505	19.9474	20.2015	20.4550	20.5452	20.5659	20.5669	20.5679	20.5580	20.4148	20.0484	19.7210	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7505	19.9474	20.2015	20.4550	20.5452	20.5659	20.5669	20.5679	20.5580	20.4148	20.0484	19.7210	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9739	0.9338	0.8114	0.6214	0.4238	0.2955	0.3333	0.5663	0.8749	0.9742	0.9913	(94)
Useful gains	408.9259	462.4364	494.3468	484.8107	396.5804	268.1709	178.5853	187.0966	289.4534	387.9397	394.4003	392.2883	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	719.7530	699.1696	634.9953	528.5936	403.5714	268.6245	178.6167	187.1661	292.3300	447.8071	593.8847	715.5980	(97)
Space heating kWh	231.2554	159.0848	104.6424	31.5237	5.2013	0.0000	0.0000	0.0000	0.0000	44.5413	143.6288	240.5424	(98a)
Space heating requirement - total per year (kWh/year)												960.4201	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	231.2554	159.0848	104.6424	31.5237	5.2013	0.0000	0.0000	0.0000	0.0000	44.5413	143.6288	240.5424	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.4201	
Space heating per m2											(98c) / (4) =	18.3461	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	231.2554	159.0848	104.6424	31.5237	5.2013	0.0000	0.0000	0.0000	0.0000	44.5413	143.6288	240.5424	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	231.2554	159.0848	104.6424	31.5237	5.2013	0.0000	0.0000	0.0000	0.0000	44.5413	143.6288	240.5424	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	56.0906	49.5444	52.4677	45.7160	44.0379	39.3783	38.6350	40.3333	40.9591	46.0383	49.4029	55.4222	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1263	7.3399	8.1263	7.8642	8.1263	7.8642	8.1263	8.1263	7.8642	8.1263	7.8642	8.1263	(231)
Lighting	15.7379	12.6255	11.3679	8.3286	6.4332	5.2560	5.8686	7.6282	9.9083	13.0003	14.6838	16.1753	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												960.4201	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	558.0255	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	95.6807	(230a)
Total electricity for the above, kWh/year	95.6807	(231)
Electricity for lighting (calculated in Appendix L)	127.0136	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1741.1399	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	960.4201	0.1575	151.3069	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	558.0255	0.1411	78.7309	(264)
Space and water heating			230.0378	(265)
Pumps, fans and electric keep-hot	95.6807	0.1387	13.2721	(267)
Energy for lighting	127.0136	0.1443	18.3320	(268)
Total CO2, kg/year			261.6419	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	960.4201	1.5832	1520.5319	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	558.0255	1.5217	849.1490	(278)
Space and water heating			2369.6809	(279)
Pumps, fans and electric keep-hot	95.6807	1.5128	144.7458	(281)
Energy for lighting	127.0136	1.5338	194.8176	(282)
Total Primary energy kWh/year			2709.2444	(286)
Dwelling Primary energy Rate (DPER)			51.7500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.3500 (1b)	x	2.5500 (2b)	=	133.4925	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.3500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.4925	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1498	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3998	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3398	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4333	0.4248	0.4163	0.3738	0.3653	0.3229	0.3229	0.3144	0.3398	0.3653	0.3823	0.3993	(22b)
Effective ac	0.5939	0.5902	0.5867	0.5699	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5731	0.5797	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0200	1.1450	12.6183			(27)
Brickwork	31.4100	11.0200	20.3900	0.1800	3.6702			(29a)
Communal Wall	18.1100	2.0600	16.0500	0.1800	2.8890			(29a)
Smoke Shaft Wall	3.9300		3.9300	0.1800	0.7074			(29a)
Terrace Roof	5.9300		5.9300	0.1100	0.6523			(30)
Total net area of external elements Aum(A, m2)			59.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.5972			(33)
Main dwelling								
Party Wall 1			34.9400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 269.6949 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	26.3100	0.0700	1.8417	
E16 Corner (normal)	5.7600	0.0900	0.5184	
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0900	-0.2592	
E18 Party wall between dwellings	8.6400	0.0600	0.5184	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.2600	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.9800	0.0500	0.2990	
E4 Jamb	13.6900	0.0500	0.6845	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.0200	0.0730	
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728	
E15 Flat roof with parapet	6.8200	0.5600	3.8192	
E5 Ground floor (normal)	24.5000	0.1600	3.9200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5878 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.1850 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.1618	26.0012	25.8438	25.1045	24.9661	24.3222	24.3222	24.2029	24.5702	24.9661	25.2460	25.5385	(38)
Heat transfer coeff	60.3468	60.1862	60.0288	59.2895	59.1511	58.5072	58.5072	58.3880	58.7552	59.1511	59.4310	59.7235	(39)

Average = Sum(39)m / 12 = 59.2888

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1528	1.1497	1.1467	1.1326	1.1299	1.1176	1.1176	1.1153	1.1224	1.1299	1.1353	1.1409	(40)
HLP (average)												1.1325	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7594 (42)

Hot water usage for mixer showers

53.7188	52.9115	51.7351	49.4843	47.8233	45.9709	44.9181	46.0855	47.3653	49.3542	51.6533	53.5130	(42a)

Hot water usage for baths

23.2241	22.8792	22.3934	21.4979	20.8273	20.0837	19.6821	20.1644	20.6896	21.4852	22.3992	23.1456	(42b)

Hot water usage for other uses

32.6480	31.4608	30.2736	29.0864	27.8992	26.7120	26.7120	27.8992	29.0864	30.2736	31.4608	32.6480	(42c)

Average daily hot water use (litres/day) 100.7393 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.5908	107.2514	104.4021	100.0686	96.5498	92.7667	91.3122	94.1491	97.1412	101.1130	105.5133	109.3065	(44)
Energy conte	173.5651	152.7246	160.4622	136.9889	129.9746	114.0674	110.4341	116.5763	119.7849	137.2093	150.3230	171.1475	(45)

Energy content (annual) Total = Sum(45)m = 1673.2580

Distribution loss (46)m = 0.15 x (45)m

26.0348	22.9087	24.0693	20.5483	19.4962	17.1101	16.5651	17.4864	17.9677	20.5814	22.5485	25.6721	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

220.1600	194.8103	207.0571	182.0808	176.5695	159.1593	157.0290	163.1712	164.8767	183.8042	195.4149	217.7424	(62)
WWHRS -24.5580	-21.7193	-22.7432	-18.8323	-17.5510	-15.0185	-14.0775	-14.9700	-15.5387	-18.3184	-20.7526	-24.1032	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

195.6020	173.0910	184.3139	163.2485	159.0185	144.1408	142.9516	148.2012	149.3380	165.4858	174.6623	193.6392	(64)

Total per year (kWh/year) = Sum(64)m = 1993.6929 (64)

12Total per year (kWh/year) 1994 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

94.9863	84.4495	90.6296	81.6223	80.4925	74.0009	73.9953	76.0375	75.9019	82.8980	86.0559	94.1825	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.5384	85.8460	77.5384	80.1230	77.5384	80.1230	77.5384	77.5384	80.1230	77.5384	80.1230	77.5384	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.3335	154.9247	150.9151	142.3792	131.6041	121.4771	114.7116	113.1205	117.1300	125.6660	136.4410	146.5681	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	(71)
Water heating gains (Table 5)													
	127.6698	125.6689	121.8140	113.3643	108.1888	102.7790	99.4560	102.2010	105.4194	111.4221	119.5221	126.5894	(72)
Total internal gains													
	410.9326	418.8305	402.6583	388.2574	369.7222	353.7700	341.0969	342.2507	352.0633	367.0173	388.4770	403.0867	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.0200	19.6403	0.6300	0.7000	0.7700	66.1456	(76)

Solar gains	66.1456	129.3948	213.0947	310.7860	380.8799	389.8983	371.1991	318.8545	247.8380	153.5378	82.4757	54.3949	(83)
Total gains	477.0782	548.2253	615.7531	699.0433	750.6021	743.6683	712.2960	661.1053	599.9013	520.5551	470.9527	457.4816	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.9879	65.1613	65.3322	66.1469	66.3016	67.0313	67.0313	67.1682	66.7483	66.3016	65.9894	65.6661	
alpha	5.3325	5.3441	5.3555	5.4098	5.4201	5.4688	5.4688	5.4779	5.4499	5.4201	5.3993	5.3777	
util living area													
	0.9902	0.9787	0.9485	0.8547	0.6908	0.4976	0.3605	0.4045	0.6477	0.9054	0.9787	0.9920	(86)
MIT	19.9684	20.1664	20.4476	20.7681	20.9390	20.9914	20.9988	20.9978	20.9673	20.7217	20.2943	19.9390	(87)
Th 2	19.9580	19.9605	19.9629	19.9743	19.9765	19.9865	19.9865	19.9883	19.9826	19.9765	19.9721	19.9676	(88)
util rest of house													
	0.9869	0.9719	0.9325	0.8164	0.6283	0.4215	0.2780	0.3165	0.5637	0.8697	0.9707	0.9893	(89)
MIT 2	18.7859	19.0363	19.3838	19.7612	19.9319	19.9823	19.9861	19.9877	19.9641	19.7236	19.2087	18.7559	(90)
Living area fraction									fLA = Living area / (4) =			0.4577	(91)
MIT	19.3271	19.5535	19.8707	20.2221	20.3928	20.4442	20.4496	20.4500	20.4232	20.1804	19.7056	19.2974	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3271	19.5535	19.8707	20.2221	20.3928	20.4442	20.4496	20.4500	20.4232	20.1804	19.7056	19.2974	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9686	0.9309	0.8264	0.6546	0.4562	0.3158	0.3569	0.6012	0.8777	0.9681	0.9870	(94)
Useful gains	469.5907	531.0360	573.1819	577.6829	491.3340	339.2729	224.9464	235.9253	360.6415	456.9136	455.9163	451.5389	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	906.8373	881.9412	802.6280	671.2797	514.1911	341.9272	225.2304	236.4701	371.5229	566.6927	749.1623	901.6692	(97)
Space heating kWh													
	325.3115	235.8083	170.7079	67.3897	17.0057	0.0000	0.0000	0.0000	0.0000	81.6757	211.1371	334.8969	(98a)
Space heating requirement - total per year (kWh/year)												1443.9329	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	325.3115	235.8083	170.7079	67.3897	17.0057	0.0000	0.0000	0.0000	0.0000	81.6757	211.1371	334.8969	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1443.9329	
Space heating per m2											(98c) / (4) =	27.5823	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	325.3115	235.8083	170.7079	67.3897	17.0057	0.0000	0.0000	0.0000	0.0000	81.6757	211.1371	334.8969	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	352.4501	255.4803	184.9490	73.0116	18.4243	0.0000	0.0000	0.0000	0.0000	88.4893	228.7510	362.8353	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.6020	173.0910	184.3139	163.2485	159.0185	144.1408	142.9516	148.2012	149.3380	165.4858	174.6623	193.6392	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1922	84.7537	83.8882	82.2353	80.5891	79.8000	79.8000	79.8000	79.8000	82.5653	84.4862	85.2764	(217)
Fuel for water heating, kWh/month													
	229.6009	204.2283	219.7138	198.5139	197.3201	180.6276	179.1373	185.7158	187.1403	200.4303	206.7348	227.0725	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1109	12.9248	11.6373	8.5260	6.5857	5.3806	6.0077	7.8091	10.1432	13.3085	15.0319	16.5587	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1602	-21.0525	-31.9000	-37.8868	-42.6541	-40.4962	-40.0225	-36.8951	-31.6840	-24.9668	-15.9561	-12.1200	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0025	-10.7638	-21.8424	-33.4666	-44.8927	-45.3228	-44.7699	-37.5961	-27.1651	-15.5871	-6.7423	-3.9368	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1564.3910	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2416.2357	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.0245	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-646.8825	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3549.7687	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1564.3910	0.2100	328.5221	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2416.2357	0.2100	507.4095	(264)
Space and water heating			835.9316	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.0245	0.1443	18.7666	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.7942	0.1335	-46.6855	
PV Unit electricity exported	-297.0882	0.1253	-37.2333	
Total			-83.9188	(269)
Total CO2, kg/year			782.7086	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1564.3910	1.1300	1767.7618	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2416.2357	1.1300	2730.3463	(278)
Space and water heating			4498.1081	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.0245	1.5338	199.4359	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.7942	1.4932	-522.3136	
PV Unit electricity exported	-297.0882	0.4600	-136.6639	
Total			-658.9775	(283)
Total Primary energy kWh/year			4168.6673	(286)
Target Primary Energy Rate (TPER)			79.6300	(287)

Full SAP Calculation Printout

Plot Reference	P-14	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-14
Plot Address	Flat 9, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.00	**TER**	14.95
Environmental	97 A	**% DER < TER**			66.56
CO_2 Emissions (t/year)	0.21	**DFEE**	36.26	**TFEE**	36.85
Compliance Check	See BREL	**% DFEE < TFEE**			1.61
% DPER < TPER	35.01	**DPER**	51.75	**TPER**	79.63

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.3500	(1b)	x 2.5500	(2b) =	133.4925	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.3500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.4925	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1498	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5600	(17)
Infiltration rate		0.2778	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2361	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3011	0.2952	0.2893	0.2598	0.2539	0.2243	0.2243	0.2184	0.2361	0.2539	0.2657	0.2775	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5453	0.5436	0.5418	0.5337	0.5322	0.5252	0.5252	0.5239	0.5279	0.5322	0.5353	0.5385	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2200	0.8646	110.0000	432.3000	(29a)
Terrace Roof	5.9300		5.9300	0.1400	0.8302	9.0000	53.3700	(30)
Total net area of external elements Aum(A, m2)			59.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5207			(33)
Main dwelling								
Party Wall 1			34.9400	0.0000	0.0000	110.0000	3843.3998	(32)
Party Floor 1			52.3500			70.0000	3664.5000	(32d)
Party Ceiling 1			46.4200			30.0000	1392.6000	(32b)
Internal Wall 1			91.4400			9.0000	822.9600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14118.5299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		269.6949 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	26.3100	0.0380	0.9998	
E16 Corner (normal)	5.7600	0.0540	0.3110	
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794	
E18 Party wall between dwellings	8.6400	0.0380	0.3283	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.2600	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.9800	0.0500	0.2990	
E4 Jamb	13.6900	0.0160	0.2190	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045	
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893	
E15 Flat roof with parapet	6.8200	0.3000	2.0460	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.9616 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	34.4823 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.0230	23.9455	23.8695	23.5125	23.4457	23.1348	23.1348	23.0772	23.2546	23.4457	23.5808	23.7221	(38)
Heat transfer coeff	58.5054	58.4278	58.3518	57.9949	57.9281	57.6172	57.6172	57.5596	57.7369	57.9281	58.0632	58.2044	(39)
Average = Sum(39)m / 12 =												57.9945	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1176	1.1161	1.1146	1.1078	1.1066	1.1006	1.1006	1.0995	1.1029	1.1066	1.1091	1.1118	(40)
HLP (average)												1.1078	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7594	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	23.2241	22.8792	22.3934	21.4979	20.8273	20.0837	19.6821	20.1644	20.6896	21.4852	22.3992	23.1456	(42b)
Hot water usage for other uses	32.6480	31.4608	30.2736	29.0864	27.8992	26.7120	26.7120	27.8992	29.0864	30.2736	31.4608	32.6480	(42c)
Average daily hot water use (litres/day)												51.2123	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.8720	54.3399	52.6670	50.5843	48.7265	46.7957	46.3941	48.0636	49.7759	51.7588	53.8600	55.7935	(44)
Energy conte	88.4876	77.3793	80.9473	69.2473	65.5952	57.5408	56.1096	59.5128	61.3787	70.2362	76.7334	87.3592	(45)
Energy content (annual)											Total = Sum(45)m =	850.5274	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	75.2145	65.7724	68.8052	58.8602	55.7559	48.9097	47.6932	50.5859	52.1719	59.7007	65.2234	74.2553	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	75.2145	65.7724	68.8052	58.8602	55.7559	48.9097	47.6932	50.5859	52.1719	59.7007	65.2234	74.2553	(64)
										Total per year (kWh/year) = Sum(64)m =		722.9483	(64)
12Total per year (kWh/year)												723	(64)
Electric shower(s)	43.0198	38.3310	41.8560	39.9426	40.6922	38.8164	40.1102	40.6922	39.9426	41.8560	41.0689	43.0198	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		489.3476	(64a)
Heat gains from water heating, kWh/month	29.5586	26.0259	27.6653	24.7007	24.1120	21.9315	21.9509	22.8195	23.0286	25.3892	26.5731	29.3188	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3233	85.6079	77.3233	79.9007	77.3233	79.9007	77.3233	77.3233	79.9007	77.3233	79.9007	77.3233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.3335	154.9247	150.9151	142.3792	131.6041	121.4771	114.7116	113.1205	117.1300	125.6660	136.4410	146.5681	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	(71)
Water heating gains (Table 5)	39.7293	38.7290	37.1845	34.3066	32.4086	30.4604	29.5038	30.6714	31.9842	34.1252	36.9071	39.4070	(72)
Total internal gains	319.7770	328.6524	314.8138	305.9774	290.7269	281.2291	270.9296	270.5060	278.4059	286.5054	302.6397	312.6892	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	19.6403	0.3100	0.0000	0.7700	55.8825	(76)

Solar gains	55.8825	109.3181	180.0313	262.5649	321.7831	329.4023	313.6044	269.3816	209.3838	129.7151	69.6789	45.9551	(83)
Total gains	375.6595	437.9705	494.8451	568.5423	612.5101	610.6314	584.5340	539.8876	487.7897	416.2205	372.3186	358.6443	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.0334	67.1223	67.2098	67.6235	67.7014	68.0668	68.0668	68.1349	67.9256	67.7014	67.5439	67.3800	
alpha	5.4689	5.4748	5.4807	5.5082	5.5134	5.5378	5.5378	5.5423	5.5284	5.5134	5.5029	5.4920	
util living area	0.9967	0.9918	0.9773	0.9202	0.7874	0.5887	0.4313	0.4856	0.7501	0.9558	0.9923	0.9974	(86)
MIT	19.8319	20.0183	20.2970	20.6533	20.8904	20.9819	20.9973	20.9949	20.9368	20.6026	20.1505	19.7968	(87)
Th 2	19.9865	19.9877	19.9889	19.9944	19.9955	20.0003	20.0003	20.0012	19.9985	19.9955	19.9934	19.9912	(88)
util rest of house	0.9955	0.9890	0.9693	0.8935	0.7287	0.5035	0.3346	0.3828	0.6662	0.9351	0.9891	0.9965	(89)
MIT 2	18.9324	19.1183	19.3926	19.7315	19.9290	19.9932	19.9997	20.0000	19.9682	19.6943	19.2550	18.9012	(90)
Living area fraction										fLA = Living area / (4) =		0.4577	(91)
MIT	19.3441	19.5302	19.8066	20.1534	20.3690	20.4457	20.4563	20.4553	20.4115	20.1100	19.6648	19.3111	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3441	19.5302	19.8066	20.1534	20.3690	20.4457	20.4563	20.4553	20.4115	20.1100	19.6648	19.3111	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9873	0.9675	0.8983	0.7518	0.5422	0.3790	0.4300	0.7028	0.9379	0.9878	0.9957	(94)
Useful gains	373.6053	432.4080	478.7830	510.7121	460.4822	331.0966	221.5376	232.1485	342.8026	390.3637	367.7617	357.0997	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	880.1607	854.8118	776.4625	652.6392	502.1804	336.8132	222.1884	233.4242	364.4067	550.8970	729.5551	879.5342	(97)
Space heating kWh	376.8772	283.8554	221.4735	102.1875	31.0235	0.0000	0.0000	0.0000	0.0000	119.4368	260.4913	388.6913	(98a)
Space heating requirement - total per year (kWh/year)												1784.0364	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	376.8772	283.8554	221.4735	102.1875	31.0235	0.0000	0.0000	0.0000	0.0000	119.4368	260.4913	388.6913	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1784.0364	
Space heating per m2											(98c) / (4) =	34.0790	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	541.6012	426.3669	437.4528	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9277	0.9660	0.9483	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	502.4677	411.8615	414.8326	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	686.0543	657.0798	606.3754	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	132.1823	182.4424	142.5078	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.0456	45.6106	35.6270	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												114.2832	(107)
Energy for space heating												34.0790	(99)
Energy for space cooling												2.1831	(108)
Total												36.2621	(109)
Fabric Energy Efficiency (DFEE)												36.3	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.3500	(1b)	x 2.5500	(2b) =	133.4925	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.3500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.4925	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) =	0.1498	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3998	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3398	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4333	0.4248	0.4163	0.3738	0.3653	0.3229	0.3229	0.3144	0.3398	0.3653	0.3823	0.3993	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5939	0.5902	0.5867	0.5699	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5731	0.5797	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0200	1.1450	12.6183			(27)
Brickwork	31.4100	11.0200	20.3900	0.1800	3.6702			(29a)
Communal Wall	18.1100	2.0600	16.0500	0.1800	2.8890			(29a)
Smoke Shaft Wall	3.9300		3.9300	0.1800	0.7074			(29a)
Terrace Roof	5.9300		5.9300	0.1100	0.6523			(30)
Total net area of external elements Aum(A, m2)			59.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.5972			(33)
Main dwelling								
Party Wall 1			34.9400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	269.6949	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.3100	0.0700	1.8417
E16 Corner (normal)	5.7600	0.0900	0.5184
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0900	-0.2592
E18 Party wall between dwellings	8.6400	0.0600	0.5184
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.2600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9800	0.0500	0.2990
E4 Jamb	13.6900	0.0500	0.6845
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.0200	0.0730
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728
E15 Flat roof with parapet	6.8200	0.5600	3.8192
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.5878	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	34.1850	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.1618	26.0012	25.8438	25.1045	24.9661	24.3222	24.3222	24.2029	24.5702	24.9661	25.2460	25.5385	(38)
Heat transfer coeff	60.3468	60.1862	60.0288	59.2895	59.1511	58.5072	58.5072	58.3880	58.7552	59.1511	59.4310	59.7235	(39)
Average = Sum(39)m / 12 =												59.2888	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1528	1.1497	1.1467	1.1326	1.1299	1.1176	1.1176	1.1153	1.1224	1.1299	1.1353	1.1409	(40)
HLP (average)												1.1325	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7594	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	23.2241	22.8792	22.3934	21.4979	20.8273	20.0837	19.6821	20.1644	20.6896	21.4852	22.3992	23.1456	(42b)

Hot water usage for other uses

	32.6480	31.4608	30.2736	29.0864	27.8992	26.7120	26.7120	27.8992	29.0864	30.2736	31.4608	32.6480	(42c)

Average daily hot water use (litres/day)	51.2123	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.8720	54.3399	52.6670	50.5843	48.7265	46.7957	46.3941	48.0636	49.7759	51.7588	53.8600	55.7935	(44)
Energy conte	88.4876	77.3793	80.9473	69.2473	65.5952	57.5408	56.1096	59.5128	61.3787	70.2362	76.7334	87.3592	(45)

Energy content (annual) Total = Sum(45)m =	850.5274	
Distribution loss (46)m = 0.15 x (45)m		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	75.2145	65.7724	68.8052	58.8602	55.7559	48.9097	47.6932	50.5859	52.1719	59.7007	65.2234	74.2553	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	75.2145	65.7724	68.8052	58.8602	55.7559	48.9097	47.6932	50.5859	52.1719	59.7007	65.2234	74.2553	(64)

Total per year (kWh/year) = Sum(64)m =	722.9483	(64)
12Total per year (kWh/year)	723	(64)

Electric shower(s)

	43.0198	38.3310	41.8560	39.9426	40.6922	38.8164	40.1102	40.6922	39.9426	41.8560	41.0689	43.0198	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	489.3476	(64a)

Heat gains from water heating, kWh/month

	29.5586	26.0259	27.6653	24.7007	24.1120	21.9315	21.9509	22.8195	23.0286	25.3892	26.5731	29.3188 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	77.5384	85.8460	77.5384	80.1230	77.5384	80.1230	77.5384	77.5384	80.1230	77.5384	80.1230	77.5384	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	153.3335	154.9247	150.9151	142.3792	131.6041	121.4771	114.7116	113.1205	117.1300	125.6660	136.4410	146.5681	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	(71)

Water heating gains (Table 5)

	39.7293	38.7290	37.1845	34.3066	32.4086	30.4604	29.5038	30.6714	31.9842	34.1252	36.9071	39.4070	(72)

Total internal gains

	319.9921	328.8906	315.0289	306.1996	290.9420	281.4514	271.1447	270.7211	278.6282	286.7205	302.8620	312.9043	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.0200	19.6403	0.6300	0.7000	0.7700	66.1456	(76)

Solar gains	66.1456	129.3948	213.0947	310.7860	380.8799	389.8983	371.1991	318.8545	247.8380	153.5378	82.4757	54.3949	(83)
Total gains	386.1377	458.2853	528.1236	616.9856	671.8219	671.3497	642.3438	589.5757	526.4662	440.2583	385.3377	367.2992	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.9879	65.1613	65.3322	66.1469	66.3016	67.0313	67.0313	67.1682	66.7483	66.3016	65.9894	65.6661	
alpha	5.3325	5.3441	5.3555	5.4098	5.4201	5.4688	5.4688	5.4779	5.4499	5.4201	5.3993	5.3777	
util living area													
	0.9963	0.9903	0.9717	0.9001	0.7494	0.5474	0.3991	0.4522	0.7177	0.9475	0.9912	0.9971	(86)
MIT	19.7995	20.0069	20.3110	20.6867	20.9097	20.9865	20.9980	20.9962	20.9466	20.6169	20.1417	19.7700	(87)
Th 2	19.9580	19.9605	19.9629	19.9743	19.9765	19.9865	19.9865	19.9883	19.9826	19.9765	19.9721	19.9676	(88)
util rest of house													
	0.9950	0.9869	0.9620	0.8690	0.6878	0.4654	0.3081	0.3546	0.6321	0.9237	0.9876	0.9961	(89)
MIT 2	18.8776	19.0850	19.3840	19.7415	19.9233	19.9813	19.9860	19.9874	19.9578	19.6903	19.2292	18.8559	(90)
Living area fraction										fLA = Living area / (4) =		0.4577	(91)
MIT	19.2996	19.5069	19.8083	20.1741	20.3748	20.4413	20.4492	20.4491	20.4104	20.1144	19.6468	19.2742	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2996	19.5069	19.8083	20.1741	20.3748	20.4413	20.4492	20.4491	20.4104	20.1144	19.6468	19.2742	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9939	0.9850	0.9602	0.8757	0.7129	0.5028	0.3499	0.3994	0.6699	0.9275	0.9861	0.9952	(94)
Useful gains	383.7706	451.4260	507.1014	540.3021	478.9285	337.5274	224.7312	235.4677	352.6553	408.3287	379.9872	365.5417	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	905.1751	879.1355	798.8811	668.4343	513.1229	341.7609	225.2057	236.4191	370.7668	562.7875	745.6712	900.2874	(97)
Space heating kWh													
	387.9249	287.4208	217.0841	92.2552	25.4406	0.0000	0.0000	0.0000	0.0000	114.9173	263.2924	397.8508	(98a)
Space heating requirement - total per year (kWh/year)												1786.1862	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	387.9249	287.4208	217.0841	92.2552	25.4406	0.0000	0.0000	0.0000	0.0000	114.9173	263.2924	397.8508	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1786.1862	
Space heating per m2											(98c) / (4) =	34.1201	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	549.9677	432.9533	443.7485	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9454	0.9750	0.9607	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	519.9283	422.1305	426.3047	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	756.7828	724.4186	664.2274	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	170.5353	224.9024	177.0145	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	42.6338	56.2256	44.2536	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												143.1130	(107)
Energy for space heating												34.1201	(99)
Energy for space cooling												2.7338	(108)
Total												36.8539	(109)
Fabric Energy Efficiency (TFEE)												36.9	(109)

Full SAP Calculation Printout

Plot Reference	P-14	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-14
Plot Address	Flat 9, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.00	**TER**	14.95
Environmental	97 A	**% DER < TER**			66.56
CO_2 Emissions (t/year)	0.21	**DFEE**	36.26	**TFEE**	36.85
Compliance Check	See BREL	**% DFEE < TFEE**			1.61
% DPER < TPER	35.01	**DPER**	51.75	**TPER**	79.63

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.3500	(1b)	x 2.5500	(2b) =	133.4925	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.3500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.4925	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5600	(17)
Infiltration rate		0.1280	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1088	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1387	0.1360	0.1333	0.1197	0.1170	0.1034	0.1034	0.1006	0.1088	0.1170	0.1224	0.1278	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2747	0.2720	0.2693	0.2557	0.2530	0.2394	0.2394	0.2366	0.2448	0.2530	0.2584	0.2638	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2200	0.8646	110.0000	432.3000	(29a)
Terrace Roof	5.9300		5.9300	0.1400	0.8302	9.0000	53.3700	(30)
Total net area of external elements Aum(A, m2)			59.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5207			(33)
Main dwelling								
Party Wall 1			34.9400	0.0000	0.0000	110.0000	3843.3998	(32)
Party Floor 1			52.3500			70.0000	3664.5000	(32d)
Party Ceiling 1			46.4200			30.0000	1392.6000	(32b)
Internal Wall 1			91.4400			9.0000	822.9600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14118.5299 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 269.6949 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.3100	0.0380	0.9998
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.2600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9800	0.0500	0.2990
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E15 Flat roof with parapet	6.8200	0.3000	2.0460
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.9616 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.4823 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.1021	11.9823	11.8625	11.2633	11.1435	10.5444	10.5444	10.4246	10.7841	11.1435	11.3832	11.6228	(38)
Heat transfer coeff	46.5844	46.4646	46.3448	45.7457	45.6259	45.0268	45.0268	44.9069	45.2664	45.6259	45.8655	46.1052	(39)

Average = Sum(39)m / 12 = 45.7157

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8899	0.8876	0.8853	0.8738	0.8716	0.8601	0.8601	0.8578	0.8647	0.8716	0.8761	0.8807	(40)
HLP (average)												0.8733	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7594 (42)

Hot water usage for mixer showers

53.7188	52.9115	51.7351	49.4843	47.8233	45.9709	44.9181	46.0855	47.3653	49.3542	51.6533	53.5130	(42a)

Hot water usage for baths

23.2241	22.8792	22.3934	21.4979	20.8273	20.0837	19.6821	20.1644	20.6896	21.4852	22.3992	23.1456	(42b)

Hot water usage for other uses

32.6480	31.4608	30.2736	29.0864	27.8992	26.7120	26.7120	27.8992	29.0864	30.2736	31.4608	32.6480	(42c)

Average daily hot water use (litres/day) 100.7393 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.5908	107.2514	104.4021	100.0686	96.5498	92.7667	91.3122	94.1491	97.1412	101.1130	105.5133	109.3065	(44)
Energy conte	173.5651	152.7246	160.4622	136.9889	129.9746	114.0674	110.4341	116.5763	119.7849	137.2093	150.3230	171.1475	(45)

Energy content (annual) Total = Sum(45)m = 1673.2580

Distribution loss (46)m = 0.15 x (45)m

26.0348	22.9087	24.0693	20.5483	19.4962	17.1101	16.5651	17.4864	17.9677	20.5814	22.5485	25.6721	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(64)

Total per year (kWh/year) = Sum(64)m = 2018.1830 (64)

12Total per year (kWh/year) 2018 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.7104	50.7809	53.3537	45.5488	43.2165	37.9274	36.7193	38.7616	39.8285	45.6221	49.9824	56.9066	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3233	85.6079	77.3233	79.9007	77.3233	79.9007	77.3233	77.3233	79.9007	77.3233	79.9007	77.3233	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.3335	154.9247	150.9151	142.3792	131.6041	121.4771	114.7116	113.1205	117.1300	125.6660	136.4410	146.5681	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	(71)
Water heating gains (Table 5)	77.5677	75.5669	71.7119	63.2622	58.0868	52.6770	49.3540	52.0989	55.3173	61.3200	69.4200	76.4873	(72)
Total internal gains	357.6155	365.4904	349.3412	334.9330	316.4051	303.4457	290.7798	291.9336	301.7390	313.7002	335.1527	349.7696	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	19.6403	0.3100	0.0000	0.7700	55.8825	(76)

Solar gains	55.8825	109.3181	180.0313	262.5649	321.7831	329.4023	313.6044	269.3816	209.3838	129.7151	69.6789	45.9551	(83)
Total gains	413.4980	474.8084	529.3725	597.4979	638.1882	632.8480	604.3842	561.3152	511.1228	443.4153	404.8316	395.7246	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	84.1872	84.4043	84.6225	85.7308	85.9559	87.0996	87.0996	87.3320	86.6385	85.9559	85.5068	85.0624	
alpha	6.6125	6.6270	6.6415	6.7154	6.7304	6.8066	6.8066	6.8221	6.7759	6.7304	6.7005	6.6708	
util living area	0.9928	0.9815	0.9481	0.8348	0.6500	0.4542	0.3277	0.3678	0.6025	0.8982	0.9820	0.9944	(86)
MIT	20.2586	20.4306	20.6565	20.8893	20.9807	20.9985	20.9999	20.9997	20.9911	20.8457	20.5146	20.2299	(87)
Th 2	20.1761	20.1781	20.1800	20.1898	20.1917	20.2015	20.2015	20.2035	20.1976	20.1917	20.1878	20.1839	(88)
util rest of house	0.9905	0.9758	0.9334	0.7991	0.5986	0.3981	0.2683	0.3042	0.5362	0.8649	0.9756	0.9926	(89)
MIT 2	19.3217	19.5395	19.8176	20.0886	20.1777	20.2008	20.2015	20.2034	20.1925	20.0511	19.6549	19.2915	(90)
Living area fraction									fLA = Living area / (4) =			0.4577	(91)
MIT	19.7505	19.9474	20.2015	20.4550	20.5452	20.5659	20.5669	20.5679	20.5580	20.4148	20.0484	19.7210	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7505	19.9474	20.2015	20.4550	20.5452	20.5659	20.5669	20.5679	20.5580	20.4148	20.0484	19.7210	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9739	0.9338	0.8114	0.6214	0.4238	0.2955	0.3333	0.5663	0.8749	0.9742	0.9913	(94)
Useful gains	408.9259	462.4364	494.3468	484.8107	396.5804	268.1709	178.5853	187.0966	289.4534	387.9397	394.4003	392.2883	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	719.7530	699.1696	634.9953	528.5936	403.5714	268.6245	178.6167	187.1661	292.3300	447.8071	593.8847	715.5980	(97)
Space heating kWh	231.2554	159.0848	104.6424	31.5237	5.2013	0.0000	0.0000	0.0000	0.0000	44.5413	143.6288	240.5424	(98a)
Space heating requirement - total per year (kWh/year)												960.4201	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	231.2554	159.0848	104.6424	31.5237	5.2013	0.0000	0.0000	0.0000	0.0000	44.5413	143.6288	240.5424	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.4201	
Space heating per m2											(98c) / (4) =	18.3461	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	231.2554	159.0848	104.6424	31.5237	5.2013	0.0000	0.0000	0.0000	0.0000	44.5413	143.6288	240.5424	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	231.2554	159.0848	104.6424	31.5237	5.2013	0.0000	0.0000	0.0000	0.0000	44.5413	143.6288	240.5424	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	56.0906	49.5444	52.4677	45.7160	44.0379	39.3783	38.6350	40.3333	40.9591	46.0383	49.4029	55.4222	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1263	7.3399	8.1263	7.8642	8.1263	7.8642	8.1263	8.1263	7.8642	8.1263	7.8642	8.1263	(231)
Lighting	15.7379	12.6255	11.3679	8.3286	6.4332	5.2560	5.8686	7.6282	9.9083	13.0003	14.6838	16.1753	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												960.4201	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	558.0255	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	95.6807	(230a)
Total electricity for the above, kWh/year	95.6807	(231)
Electricity for lighting (calculated in Appendix L)	127.0136	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1741.1399	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	960.4201	0.1575	151.3069	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	558.0255	0.1411	78.7309	(264)
Space and water heating			230.0378	(265)
Pumps, fans and electric keep-hot	95.6807	0.1387	13.2721	(267)
Energy for lighting	127.0136	0.1443	18.3320	(268)
Total CO2, kg/year			261.6419	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	960.4201	1.5832	1520.5319	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	558.0255	1.5217	849.1490	(278)
Space and water heating			2369.6809	(279)
Pumps, fans and electric keep-hot	95.6807	1.5128	144.7458	(281)
Energy for lighting	127.0136	1.5338	194.8176	(282)
Total Primary energy kWh/year			2709.2444	(286)
Dwelling Primary energy Rate (DPER)			51.7500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.3500 (1b)	x	2.5500 (2b)	=	133.4925	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.3500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.4925	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1498	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3998	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3398	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4333	0.4248	0.4163	0.3738	0.3653	0.3229	0.3229	0.3144	0.3398	0.3653	0.3823	0.3993	(22b)
Effective ac	0.5939	0.5902	0.5867	0.5699	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5731	0.5797	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0200	1.1450	12.6183			(27)
Brickwork	31.4100	11.0200	20.3900	0.1800	3.6702			(29a)
Communal Wall	18.1100	2.0600	16.0500	0.1800	2.8890			(29a)
Smoke Shaft Wall	3.9300		3.9300	0.1800	0.7074			(29a)
Terrace Roof	5.9300		5.9300	0.1100	0.6523			(30)
Total net area of external elements Aum(A, m2)			59.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.5972			(33)
Main dwelling								
Party Wall 1			34.9400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 269.6949 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	26.3100	0.0700	1.8417	
E16 Corner (normal)	5.7600	0.0900	0.5184	
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0900	-0.2592	
E18 Party wall between dwellings	8.6400	0.0600	0.5184	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.2600	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.9800	0.0500	0.2990	
E4 Jamb	13.6900	0.0500	0.6845	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.0200	0.0730	
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728	
E15 Flat roof with parapet	6.8200	0.5600	3.8192	
E5 Ground floor (normal)	24.5000	0.1600	3.9200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5878 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.1850 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.1618	26.0012	25.8438	25.1045	24.9661	24.3222	24.3222	24.2029	24.5702	24.9661	25.2460	25.5385	(38)
Heat transfer coeff	60.3468	60.1862	60.0288	59.2895	59.1511	58.5072	58.5072	58.3880	58.7552	59.1511	59.4310	59.7235	(39)

Average = Sum(39)m / 12 = 59.2888

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1528	1.1497	1.1467	1.1326	1.1299	1.1176	1.1176	1.1153	1.1224	1.1299	1.1353	1.1409	(40)
HLP (average)												1.1325	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7594 (42)

Hot water usage for mixer showers

53.7188	52.9115	51.7351	49.4843	47.8233	45.9709	44.9181	46.0855	47.3653	49.3542	51.6533	53.5130	(42a)

Hot water usage for baths

23.2241	22.8792	22.3934	21.4979	20.8273	20.0837	19.6821	20.1644	20.6896	21.4852	22.3992	23.1456	(42b)

Hot water usage for other uses

32.6480	31.4608	30.2736	29.0864	27.8992	26.7120	26.7120	27.8992	29.0864	30.2736	31.4608	32.6480	(42c)

Average daily hot water use (litres/day) 100.7393 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.5908	107.2514	104.4021	100.0686	96.5498	92.7667	91.3122	94.1491	97.1412	101.1130	105.5133	109.3065	(44)
Energy conte	173.5651	152.7246	160.4622	136.9889	129.9746	114.0674	110.4341	116.5763	119.7849	137.2093	150.3230	171.1475	(45)

Energy content (annual) Total = Sum(45)m = 1673.2580

Distribution loss (46)m = 0.15 x (45)m

26.0348	22.9087	24.0693	20.5483	19.4962	17.1101	16.5651	17.4864	17.9677	20.5814	22.5485	25.6721	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

220.1600	194.8103	207.0571	182.0808	176.5695	159.1593	157.0290	163.1712	164.8767	183.8042	195.4149	217.7424	(62)
WWHRS -24.5580	-21.7193	-22.7432	-18.8323	-17.5510	-15.0185	-14.0775	-14.9700	-15.5387	-18.3184	-20.7526	-24.1032	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

195.6020	173.0910	184.3139	163.2485	159.0185	144.1408	142.9516	148.2012	149.3380	165.4858	174.6623	193.6392	(64)

Total per year (kWh/year) = Sum(64)m = 1993.6929 (64)

12Total per year (kWh/year) 1994 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

94.9863	84.4495	90.6296	81.6223	80.4925	74.0009	73.9953	76.0375	75.9019	82.8980	86.0559	94.1825	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	87.9698	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.5384	85.8460	77.5384	80.1230	77.5384	80.1230	77.5384	77.5384	80.1230	77.5384	80.1230	77.5384	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.3335	154.9247	150.9151	142.3792	131.6041	121.4771	114.7116	113.1205	117.1300	125.6660	136.4410	146.5681	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	31.7970	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	(71)
Water heating gains (Table 5)													
	127.6698	125.6689	121.8140	113.3643	108.1888	102.7790	99.4560	102.2010	105.4194	111.4221	119.5221	126.5894	(72)
Total internal gains													
	410.9326	418.8305	402.6583	388.2574	369.7222	353.7700	341.0969	342.2507	352.0633	367.0173	388.4770	403.0867	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.0200	19.6403	0.6300	0.7000	0.7700	66.1456	(76)

Solar gains	66.1456	129.3948	213.0947	310.7860	380.8799	389.8983	371.1991	318.8545	247.8380	153.5378	82.4757	54.3949	(83)
Total gains	477.0782	548.2253	615.7531	699.0433	750.6021	743.6683	712.2960	661.1053	599.9013	520.5551	470.9527	457.4816	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.9879	65.1613	65.3322	66.1469	66.3016	67.0313	67.0313	67.1682	66.7483	66.3016	65.9894	65.6661	
alpha	5.3325	5.3441	5.3555	5.4098	5.4201	5.4688	5.4688	5.4779	5.4499	5.4201	5.3993	5.3777	
util living area													
	0.9902	0.9787	0.9485	0.8547	0.6908	0.4976	0.3605	0.4045	0.6477	0.9054	0.9787	0.9920	(86)
MIT	19.9684	20.1664	20.4476	20.7681	20.9390	20.9914	20.9988	20.9978	20.9673	20.7217	20.2943	19.9390	(87)
Th 2	19.9580	19.9605	19.9629	19.9743	19.9765	19.9865	19.9865	19.9883	19.9826	19.9765	19.9721	19.9676	(88)
util rest of house													
	0.9869	0.9719	0.9325	0.8164	0.6283	0.4215	0.2780	0.3165	0.5637	0.8697	0.9707	0.9893	(89)
MIT 2	18.7859	19.0363	19.3838	19.7612	19.9319	19.9823	19.9861	19.9877	19.9641	19.7236	19.2087	18.7559	(90)
Living area fraction									fLA = Living area / (4) =			0.4577	(91)
MIT	19.3271	19.5535	19.8707	20.2221	20.3928	20.4442	20.4496	20.4500	20.4232	20.1804	19.7056	19.2974	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3271	19.5535	19.8707	20.2221	20.3928	20.4442	20.4496	20.4500	20.4232	20.1804	19.7056	19.2974	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9686	0.9309	0.8264	0.6546	0.4562	0.3158	0.3569	0.6012	0.8777	0.9681	0.9870	(94)
Useful gains	469.5907	531.0360	573.1819	577.6829	491.3340	339.2729	224.9464	235.9253	360.6415	456.9136	455.9163	451.5389	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	906.8373	881.9412	802.6280	671.2797	514.1911	341.9272	225.2304	236.4701	371.5229	566.6927	749.1623	901.6692	(97)
Space heating kWh													
	325.3115	235.8083	170.7079	67.3897	17.0057	0.0000	0.0000	0.0000	0.0000	81.6757	211.1371	334.8969	(98a)
Space heating requirement - total per year (kWh/year)												1443.9329	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	325.3115	235.8083	170.7079	67.3897	17.0057	0.0000	0.0000	0.0000	0.0000	81.6757	211.1371	334.8969	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1443.9329	
Space heating per m2											(98c) / (4) =	27.5823	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	325.3115	235.8083	170.7079	67.3897	17.0057	0.0000	0.0000	0.0000	0.0000	81.6757	211.1371	334.8969	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	352.4501	255.4803	184.9490	73.0116	18.4243	0.0000	0.0000	0.0000	0.0000	88.4893	228.7510	362.8353	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.6020	173.0910	184.3139	163.2485	159.0185	144.1408	142.9516	148.2012	149.3380	165.4858	174.6623	193.6392	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1922	84.7537	83.8882	82.2353	80.5891	79.8000	79.8000	79.8000	79.8000	82.5653	84.4862	85.2764	(217)
Fuel for water heating, kWh/month													
	229.6009	204.2283	219.7138	198.5139	197.3201	180.6276	179.1373	185.7158	187.1403	200.4303	206.7348	227.0725	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1109	12.9248	11.6373	8.5260	6.5857	5.3806	6.0077	7.8091	10.1432	13.3085	15.0319	16.5587	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1602	-21.0525	-31.9000	-37.8868	-42.6541	-40.4962	-40.0225	-36.8951	-31.6840	-24.9668	-15.9561	-12.1200	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0025	-10.7638	-21.8424	-33.4666	-44.8927	-45.3228	-44.7699	-37.5961	-27.1651	-15.5871	-6.7423	-3.9368	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1564.3910	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2416.2357	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.0245	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-646.8825	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3549.7687	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1564.3910	0.2100	328.5221	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2416.2357	0.2100	507.4095	(264)
Space and water heating			835.9316	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.0245	0.1443	18.7666	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.7942	0.1335	-46.6855	
PV Unit electricity exported	-297.0882	0.1253	-37.2333	
Total			-83.9188	(269)
Total CO2, kg/year			782.7086	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1564.3910	1.1300	1767.7618	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2416.2357	1.1300	2730.3463	(278)
Space and water heating			4498.1081	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.0245	1.5338	199.4359	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.7942	1.4932	-522.3136	
PV Unit electricity exported	-297.0882	0.4600	-136.6639	
Total			-658.9775	(283)
Total Primary energy kWh/year			4168.6673	(286)
Target Primary Energy Rate (TPER)			79.6300	(287)

Full SAP Calculation Printout

Plot Reference	P-14	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-14
Plot Address	Flat 9, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.00	**TER**	14.95
Environmental	97 A	**% DER < TER**			66.56
CO_2 Emissions (t/year)	0.21	**DFEE**	36.26	**TFEE**	36.85
Compliance Check	See BREL	**% DFEE < TFEE**			1.61
% DPER < TPER	35.01	**DPER**	51.75	**TPER**	79.63

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.3500	(1b)	x 2.5500	(2b) =	133.4925	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.3500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.4925	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5600 (17)
Infiltration rate		0.1280 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1088 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1387	0.1360	0.1333	0.1197	0.1170	0.1034	0.1034	0.1006	0.1088	0.1170	0.1224	0.1278	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2747	0.2720	0.2693	0.2557	0.2530	0.2394	0.2394	0.2366	0.2448	0.2530	0.2584	0.2638	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2200	0.8646	110.0000	432.3000	(29a)
Terrace Roof	5.9300		5.9300	0.1400	0.8302	9.0000	53.3700	(30)
Total net area of external elements Aum(A, m2)			59.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5207			(33)
Main dwelling								
Party Wall 1			34.9400	0.0000	0.0000	110.0000	3843.3998	(32)
Party Floor 1			52.3500			70.0000	3664.5000	(32d)
Party Ceiling 1			46.4200			30.0000	1392.6000	(32b)
Internal Wall 1			91.4400			9.0000	822.9600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14118.5299 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 269.6949 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.3100	0.0380	0.9998
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.2600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9800	0.0500	0.2990
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E15 Flat roof with parapet	6.8200	0.3000	2.0460
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.9616 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.4823 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.1021	11.9823	11.8625	11.2633	11.1435	10.5444	10.5444	10.4246	10.7841	11.1435	11.3832	11.6228	(38)
Heat transfer coeff	46.5844	46.4646	46.3448	45.7457	45.6259	45.0268	45.0268	44.9069	45.2664	45.6259	45.8655	46.1052	(39)

Average = Sum(39)m / 12 = 45.7157

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8899	0.8876	0.8853	0.8738	0.8716	0.8601	0.8601	0.8578	0.8647	0.8716	0.8761	0.8807	(40)
HLP (average)												0.8733	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7594 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.7188	52.9115	51.7351	49.4843	47.8233	45.9709	44.9181	46.0855	47.3653	49.3542	51.6533	53.5130	(42a)
Hot water usage for baths	23.2241	22.8792	22.3934	21.4979	20.8273	20.0837	19.6821	20.1644	20.6896	21.4852	22.3992	23.1456	(42b)
Hot water usage for other uses	32.6480	31.4608	30.2736	29.0864	27.8992	26.7120	26.7120	27.8992	29.0864	30.2736	31.4608	32.6480	(42c)

Average daily hot water use (litres/day) 100.7393 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.5908	107.2514	104.4021	100.0686	96.5498	92.7667	91.3122	94.1491	97.1412	101.1130	105.5133	109.3065	(44)
Energy conte	173.5651	152.7246	160.4622	136.9889	129.9746	114.0674	110.4341	116.5763	119.7849	137.2093	150.3230	171.1475	(45)

Energy content (annual) Total = Sum(45)m = 1673.2580

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss (46)m = 0.15 x (45)m	26.0348	22.9087	24.0693	20.5483	19.4962	17.1101	16.5651	17.4864	17.9677	20.5814	22.5485	25.6721	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(64)

Total per year (kWh/year) = Sum(64)m = 2018.1830 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	57.7104	50.7809	53.3537	45.5488	43.2165	37.9274	36.7193	38.7616	39.8285	45.6221	49.9824	56.9066	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9801	15.9698	12.9875	9.8324	7.3498	6.2050	6.7047	8.7151	11.6973	14.8525	17.3350	18.4798	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.8560	231.2308	225.2464	212.5062	196.4240	181.3091	171.2113	168.8365	174.8210	187.5611	203.6433	218.7583	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	(71)
Water heating gains (Table 5)	77.5677	75.5669	71.7119	63.2622	58.0868	52.6770	49.3540	52.0989	55.3173	61.3200	69.4200	76.4873	(72)
Total internal gains	406.9075	405.2711	392.4495	368.1045	344.3643	322.6947	309.7737	312.1542	324.3393	346.2373	372.9020	396.2291	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	19.6403	0.3100	0.0000	0.7700	55.8825	(76)

Solar gains	55.8825	109.3181	180.0313	262.5649	321.7831	329.4023	313.6044	269.3816	209.3838	129.7151	69.6789	45.9551	(83)
Total gains	462.7900	514.5892	572.4808	630.6694	666.1474	652.0970	623.3781	581.5358	533.7231	475.9524	442.5809	442.1841	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	84.1872	84.4043	84.6225	85.7308	85.9559	87.0996	87.0996	87.3320	86.6385	85.9559	85.5068	85.0624	
alpha	6.6125	6.6270	6.6415	6.7154	6.7304	6.8066	6.8066	6.8221	6.7759	6.7304	6.7005	6.6708	
util living area	0.9867	0.9722	0.9277	0.8072	0.6255	0.4410	0.3177	0.3550	0.5787	0.8693	0.9718	0.9897	(86)
MIT	20.3517	20.4999	20.7154	20.9101	20.9845	20.9987	20.9999	20.9998	20.9929	20.8770	20.5804	20.3190	(87)
Th 2	20.1761	20.1781	20.1800	20.1898	20.1917	20.2015	20.2015	20.2035	20.1976	20.1917	20.1878	20.1839	(88)
util rest of house	0.9827	0.9643	0.9090	0.7696	0.5752	0.3864	0.2601	0.2937	0.5143	0.8313	0.9623	0.9865	(89)
MIT 2	19.4387	19.6247	19.8857	20.1090	20.1806	20.2009	20.2015	20.2034	20.1936	20.0828	19.7352	19.4040	(90)
Living area fraction										fLA = Living area / (4) =		0.4577	(91)
MIT	19.8566	20.0252	20.2655	20.4757	20.5486	20.5661	20.5669	20.5679	20.5595	20.4463	20.1221	19.8228	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8566	20.0252	20.2655	20.4757	20.5486	20.5661	20.5669	20.5679	20.5595	20.4463	20.1221	19.8228	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9807	0.9626	0.9112	0.7834	0.5977	0.4114	0.2865	0.3218	0.5436	0.8442	0.9614	0.9847	(94)
Useful gains	453.8778	495.3359	521.6302	494.0716	398.1399	268.2548	178.5916	187.1122	290.1344	401.7837	425.4990	435.4368	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	724.6940	702.7885	637.9572	529.5368	403.7232	268.6327	178.6174	187.1677	292.3963	449.2453	597.2644	720.2925	(97)
Space heating kWh	201.4873	139.4081	86.5473	25.5350	4.1540	0.0000	0.0000	0.0000	0.0000	35.3115	123.6711	211.9327	(98a)
Space heating requirement - total per year (kWh/year)												828.0468	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.4873	139.4081	86.5473	25.5350	4.1540	0.0000	0.0000	0.0000	0.0000	35.3115	123.6711	211.9327	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												828.0468	
Space heating per m2											(98c) / (4) =	15.8175	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	201.4873	139.4081	86.5473	25.5350	4.1540	0.0000	0.0000	0.0000	0.0000	35.3115	123.6711	211.9327	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	201.4873	139.4081	86.5473	25.5350	4.1540	0.0000	0.0000	0.0000	0.0000	35.3115	123.6711	211.9327	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	56.0906	49.5444	52.4677	45.7160	44.0379	39.3783	38.6350	40.3333	40.9591	46.0383	49.4029	55.4222	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1263	7.3399	8.1263	7.8642	8.1263	7.8642	8.1263	8.1263	7.8642	8.1263	7.8642	8.1263	(231)
Lighting	15.7379	12.6255	11.3679	8.3286	6.4332	5.2560	5.8686	7.6282	9.9083	13.0003	14.6838	16.1753	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												828.0468	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												558.0255	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	95.6807	(230a)
Total electricity for the above, kWh/year	95.6807	(231)
Electricity for lighting (calculated in Appendix L)	127.0136	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1608.7667	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	828.0468	16.4900	136.5449	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	558.0255	16.4900	92.0184	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	95.6807	16.4900	15.7778	(249)
Energy for lighting	127.0136	16.4900	20.9445	(250)
Additional standing charges			0.0000	(251)
Total energy cost			265.2856	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9810	(257)
SAP value		84.0976	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	828.0468	0.1577	130.6110	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	558.0255	0.1411	78.7309	(264)
Space and water heating			209.3419	(265)
Pumps, fans and electric keep-hot	95.6807	0.1387	13.2721	(267)
Energy for lighting	127.0136	0.1443	18.3320	(268)
Total CO2, kg/year			240.9460	(272)
CO2 emissions per m2			4.6000	(273)
EI value			96.6834	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.3500	(1b)	x 2.5500	(2b) =	133.4925	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 52.3500						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.4925	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	

Measured/design AP50												2.5600	(17)
Infiltration rate												0.1280	(18)
Number of sides sheltered												2	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.8500	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1088	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1170	0.1115	0.1115	0.1034	0.1061	0.0925	0.0925	0.0898	0.0925	0.1034	0.1006	0.1088	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2530	0.2475	0.2475	0.2394	0.2421	0.2285	0.2285	0.2258	0.2285	0.2394	0.2366	0.2448	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2200	0.8646	110.0000	432.3000	(29a)
Terrace Roof	5.9300		5.9300	0.1400	0.8302	9.0000	53.3700	(30)
Total net area of external elements Aum(A, m2)			59.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5207			(33)
Main dwelling								
Party Wall 1			34.9400	0.0000	0.0000	110.0000	3843.3998	(32)
Party Floor 1			52.3500			70.0000	3664.5000	(32d)
Party Ceiling 1			46.4200			30.0000	1392.6000	(32b)
Internal Wall 1			91.4400			9.0000	822.9600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14118.5299	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	269.6949	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.3100	0.0380	0.9998
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.2600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9800	0.0500	0.2990
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E15 Flat roof with parapet	6.8200	0.3000	2.0460
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.9616	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	34.4823	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.1435	10.9039	10.9039	10.5444	10.6642	10.0651	10.0651	9.9453	10.0651	10.5444	10.4246	10.7841	(38)
Heat transfer coeff	45.6259	45.3862	45.3862	45.0268	45.1466	44.5475	44.5475	44.4276	44.5475	45.0268	44.9069	45.2664	(39)
Average = Sum(39)m / 12 =												44.9868	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8716	0.8670	0.8670	0.8601	0.8624	0.8510	0.8510	0.8487	0.8510	0.8601	0.8578	0.8647	(40)
HLP (average)												0.8593	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7594	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7188	52.9115	51.7351	49.4843	47.8233	45.9709	44.9181	46.0855	47.3653	49.3542	51.6533	53.5130	(42a)

Hot water usage for baths

23.2241	22.8792	22.3934	21.4979	20.8273	20.0837	19.6821	20.1644	20.6896	21.4852	22.3992	23.1456	(42b)

Hot water usage for other uses

32.6480	31.4608	30.2736	29.0864	27.8992	26.7120	26.7120	27.8992	29.0864	30.2736	31.4608	32.6480	(42c)

Average daily hot water use (litres/day)	100.7393	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
109.5908	107.2514	104.4021	100.0686	96.5498	92.7667	91.3122	94.1491	97.1412	101.1130	105.5133	109.3065	(44)
173.5651	152.7246	160.4622	136.9889	129.9746	114.0674	110.4341	116.5763	119.7849	137.2093	150.3230	171.1475	(45)

Energy content (annual) Total = Sum(45)m =	1673.2580	

Distribution loss (46)m = 0.15 x (45)m

26.0348	22.9087	24.0693	20.5483	19.4962	17.1101	16.5651	17.4864	17.9677	20.5814	22.5485	25.6721	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425 (64)
Total per year (kWh/year) = Sum(64)m =												2018.1830 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)

Heat gains from water heating, kWh/month

	57.7104	50.7809	53.3537	45.5488	43.2165	37.9274	36.7193	38.7616	39.8285	45.6221	49.9824	56.9066 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.9801	15.9698	12.9875	9.8324	7.3498	6.2050	6.7047	8.7151	11.6973	14.8525	17.3350	18.4798	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	228.8560	231.2308	225.2464	212.5062	196.4240	181.3091	171.2113	168.8365	174.8210	187.5611	203.6433	218.7583	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	(71)

Water heating gains (Table 5)

	77.5677	75.5669	71.7119	63.2622	58.0868	52.6770	49.3540	52.0989	55.3173	61.3200	69.4200	76.4873	(72)

Total internal gains

	406.9075	405.2711	392.4495	368.1045	344.3643	322.6947	309.7737	312.1542	324.3393	346.2373	372.9020	396.2291	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	23.8018	0.3100	0.0000	0.7700	67.7233	(76)

Solar gains	67.7233	115.7162	188.8453	278.8875	332.3940	359.6928	339.1559	299.1036	233.8898	147.2933	83.1819	56.0131	(83)
Total gains	474.6308	520.9873	581.2948	646.9920	676.7583	682.3875	648.9297	611.2578	558.2291	493.5306	456.0839	452.2422	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.9559	86.4098	86.4098	87.0996	86.8685	88.0368	88.0368	88.2742	88.0368	87.0996	87.3320	86.6385	
alpha	6.7304	6.7607	6.7607	6.8066	6.7912	6.8691	6.8691	6.8849	6.8691	6.8066	6.8221	6.7759	
util living area	0.9793	0.9599	0.8957	0.7375	0.5365	0.3393	0.2265	0.2471	0.4772	0.8019	0.9525	0.9836	(86)
MIT	20.4724	20.6063	20.8044	20.9541	20.9947	20.9998	21.0000	21.0000	20.9982	20.9351	20.6969	20.4428	(87)
Th 2	20.1917	20.1957	20.1957	20.2015	20.1996	20.2094	20.2094	20.2114	20.2094	20.2015	20.2035	20.1976	(88)
util rest of house	0.9731	0.9486	0.8707	0.6942	0.4851	0.2878	0.1723	0.1898	0.4151	0.7532	0.9371	0.9785	(89)
MIT 2	19.6028	19.7701	20.0017	20.1632	20.1962	20.2093	20.2094	20.2114	20.2085	20.1492	19.8894	19.5711	(90)
Living area fraction									fLA = Living area / (4) =			0.4577	(91)
MIT	20.0008	20.1528	20.3691	20.5252	20.5617	20.5711	20.5712	20.5723	20.5700	20.5089	20.2590	19.9701	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0008	20.1528	20.3691	20.5252	20.5617	20.5711	20.5712	20.5723	20.5700	20.5089	20.2590	19.9701	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9713	0.9479	0.8765	0.7122	0.5085	0.3114	0.1971	0.2160	0.4435	0.7728	0.9383	0.9768	(94)
Useful gains	461.0266	493.8659	509.5234	460.7716	344.1177	212.4928	127.9049	132.0495	247.6011	381.3813	427.9600	441.7401	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	679.8633	655.9602	588.6180	478.4172	345.9000	212.5412	127.9064	132.0523	248.1274	405.6412	550.5135	673.1154	(97)
Space heating kWh	162.8145	108.9273	58.8463	12.7049	1.3260	0.0000	0.0000	0.0000	0.0000	18.0494	88.2385	172.1432	(98a)
Space heating requirement - total per year (kWh/year)												623.0501	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	162.8145	108.9273	58.8463	12.7049	1.3260	0.0000	0.0000	0.0000	0.0000	18.0494	88.2385	172.1432	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												623.0501	
Space heating per m2											(98c) / (4) =	11.9016	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	162.8145	108.9273	58.8463	12.7049	1.3260	0.0000	0.0000	0.0000	0.0000	18.0494	88.2385	172.1432	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)
162.8145 108.9273 58.8463 12.7049 1.3260 0.0000 0.0000 0.0000 0.0000 18.0494 88.2385 172.1432 (211)
Space heating efficiency (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (212)
Space heating fuel (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (213)
Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
202.8601 179.1846 189.7572 165.3389 159.2696 142.4174 139.7291 145.8713 148.1349 166.5043 178.6730 200.4425 (64)
Efficiency of water heater 361.6650 (216)
(217)m 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 (217)
Fuel for water heating, kWh/month
56.0906 49.5444 52.4677 45.7160 44.0379 39.3783 38.6350 40.3333 40.9591 46.0383 49.4029 55.4222 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 8.1263 7.3399 8.1263 7.8642 8.1263 7.8642 8.1263 8.1263 7.8642 8.1263 7.8642 8.1263 (231)
Lighting 15.7379 12.6255 11.3679 8.3286 6.4332 5.2560 5.8686 7.6282 9.9083 13.0003 14.6838 16.1753 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 623.0501 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 558.0255 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 95.6807 (230a)
Total electricity for the above, kWh/year 95.6807 (231)
Electricity for lighting (calculated in Appendix L) 127.0136 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1403.7699 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	623.0501	27.6700	172.3980	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	558.0255	27.6700	154.4057	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	95.6807	27.6700	26.4749	(249)
Energy for lighting	127.0136	27.6700	35.1447	(250)
Additional standing charges			0.0000	(251)
Total energy cost			388.4231	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	623.0501	0.1586	98.8005	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	558.0255	0.1411	78.7309	(264)
Space and water heating			177.5314	(265)
Pumps, fans and electric keep-hot	95.6807	0.1387	13.2721	(267)
Energy for lighting	127.0136	0.1443	18.3320	(268)
Total CO2, kg/year			209.1355	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	623.0501	1.5870	988.7708	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	558.0255	1.5217	849.1490	(278)
Space and water heating			1837.9198	(279)
Pumps, fans and electric keep-hot	95.6807	1.5128	144.7458	(281)
Energy for lighting	127.0136	1.5338	194.8176	(282)
Total Primary energy kWh/year			2177.4833	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 84
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£388	£388	£0
Space heating	£199	£199	£0
Water heating	£154	£154	£0
Lighting	£35	£35	£0
Total cost of fuels	£388	£388	£0
Total cost of uses	£388	£388	£0
Delivered energy	27 kWh/m²	27 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	42 kWh/m²	42 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.3500	(1b)	x 2.5500	(2b) =	133.4925	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.3500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.4925	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5600	(17)
Infiltration rate		0.1280	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1088	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1387	0.1360	0.1333	0.1197	0.1170	0.1034	0.1034	0.1006	0.1088	0.1170	0.1224	0.1278	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

Effective ac	0.2747	0.2720	0.2693	0.2557	0.2530	0.2394	0.2394	0.2366	0.2448	0.2530	0.2584	0.2638 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2200	0.8646	110.0000	432.3000	(29a)
Terrace Roof	5.9300		5.9300	0.1400	0.8302	9.0000	53.3700	(30)
Total net area of external elements Aum(A, m2)			59.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5207			(33)
Main dwelling								
Party Wall 1			34.9400	0.0000	0.0000	110.0000	3843.3998	(32)
Party Floor 1			52.3500			70.0000	3664.5000	(32d)
Party Ceiling 1			46.4200			30.0000	1392.6000	(32b)
Internal Wall 1			91.4400			9.0000	822.9600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14118.5299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		269.6949 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.3100	0.0380	0.9998
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.2600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9800	0.0500	0.2990
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E15 Flat roof with parapet	6.8200	0.3000	2.0460
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.9616 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	34.4823 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.1021	11.9823	11.8625	11.2633	11.1435	10.5444	10.5444	10.4246	10.7841	11.1435	11.3832	11.6228	(38)
Heat transfer coeff	46.5844	46.4646	46.3448	45.7457	45.6259	45.0268	45.0268	44.9069	45.2664	45.6259	45.8655	46.1052	(39)
Average = Sum(39)m / 12 =												45.7157	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8899	0.8876	0.8853	0.8738	0.8716	0.8601	0.8601	0.8578	0.8647	0.8716	0.8761	0.8807	(40)
HLP (average)												0.8733	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											1.7594	(42)
Hot water usage for mixer showers	53.7188	52.9115	51.7351	49.4843	47.8233	45.9709	44.9181	46.0855	47.3653	49.3542	51.6533	53.5130	(42a)
Hot water usage for baths	23.2241	22.8792	22.3934	21.4979	20.8273	20.0837	19.6821	20.1644	20.6896	21.4852	22.3992	23.1456	(42b)
Hot water usage for other uses	32.6480	31.4608	30.2736	29.0864	27.8992	26.7120	26.7120	27.8992	29.0864	30.2736	31.4608	32.6480	(42c)
Average daily hot water use (litres/day)												100.7393	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.5908	107.2514	104.4021	100.0686	96.5498	92.7667	91.3122	94.1491	97.1412	101.1130	105.5133	109.3065	(44)
Energy conte	173.5651	152.7246	160.4622	136.9889	129.9746	114.0674	110.4341	116.5763	119.7849	137.2093	150.3230	171.1475	(45)
Energy content (annual)										Total = Sum(45)m =		1673.2580	
Distribution loss (46)m = 0.15 x (45)m	26.0348	22.9087	24.0693	20.5483	19.4962	17.1101	16.5651	17.4864	17.9677	20.5814	22.5485	25.6721	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(64)
										Total per year (kWh/year) = Sum(64)m =		2018.1830	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	57.7104	50.7809	53.3537	45.5488	43.2165	37.9274	36.7193	38.7616	39.8285	45.6221	49.9824	56.9066	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.9801	15.9698	12.9875	9.8324	7.3498	6.2050	6.7047	8.7151	11.6973	14.8525	17.3350	18.4798	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	228.8560	231.2308	225.2464	212.5062	196.4240	181.3091	171.2113	168.8365	174.8210	187.5611	203.6433	218.7583	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	(71)
Water heating gains (Table 5)													
	77.5677	75.5669	71.7119	63.2622	58.0868	52.6770	49.3540	52.0989	55.3173	61.3200	69.4200	76.4873	(72)
Total internal gains													
	406.9075	405.2711	392.4495	368.1045	344.3643	322.6947	309.7737	312.1542	324.3393	346.2373	372.9020	396.2291	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	19.6403	0.3100	0.0000	0.7700	55.8825	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	55.8825	109.3181	180.0313	262.5649	321.7831	329.4023	313.6044	269.3816	209.3838	129.7151	69.6789	45.9551	(83)
Total gains	462.7900	514.5892	572.4808	630.6694	666.1474	652.0970	623.3781	581.5358	533.7231	475.9524	442.5809	442.1841	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	84.1872	84.4043	84.6225	85.7308	85.9559	87.0996	87.0996	87.3320	86.6385	85.9559	85.5068	85.0624	
alpha	6.6125	6.6270	6.6415	6.7154	6.7304	6.8066	6.8066	6.8221	6.7759	6.7304	6.7005	6.6708	
util living area													
	0.9867	0.9722	0.9277	0.8072	0.6255	0.4410	0.3177	0.3550	0.5787	0.8693	0.9718	0.9897	(86)
MIT	20.3517	20.4999	20.7154	20.9101	20.9845	20.9987	20.9999	20.9998	20.9929	20.8770	20.5804	20.3190	(87)
Th 2	20.1761	20.1781	20.1800	20.1898	20.1917	20.2015	20.2015	20.2035	20.1976	20.1917	20.1878	20.1839	(88)
util rest of house													
	0.9827	0.9643	0.9090	0.7696	0.5752	0.3864	0.2601	0.2937	0.5143	0.8313	0.9623	0.9865	(89)
MIT 2	19.4387	19.6247	19.8857	20.1090	20.1806	20.2009	20.2015	20.2034	20.1936	20.0828	19.7352	19.4040	(90)
Living area fraction										fLA = Living area / (4) =		0.4577	(91)
MIT	19.8566	20.0252	20.2655	20.4757	20.5486	20.5661	20.5669	20.5679	20.5595	20.4463	20.1221	19.8228	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8566	20.0252	20.2655	20.4757	20.5486	20.5661	20.5669	20.5679	20.5595	20.4463	20.1221	19.8228	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9807	0.9626	0.9112	0.7834	0.5977	0.4114	0.2865	0.3218	0.5436	0.8442	0.9614	0.9847	(94)
Useful gains	453.8778	495.3359	521.6302	494.0716	398.1399	268.2548	178.5916	187.1122	290.1344	401.7837	425.4990	435.4368	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	724.6940	702.7885	637.9572	529.5368	403.7232	268.6327	178.6174	187.1677	292.3963	449.2453	597.2644	720.2925	(97)
Space heating kWh													
	201.4873	139.4081	86.5473	25.5350	4.1540	0.0000	0.0000	0.0000	0.0000	35.3115	123.6711	211.9327	(98a)
Space heating requirement - total per year (kWh/year)												828.0468	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	201.4873	139.4081	86.5473	25.5350	4.1540	0.0000	0.0000	0.0000	0.0000	35.3115	123.6711	211.9327	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												828.0468	
Space heating per m2											(98c) / (4) =	15.8175	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	201.4873	139.4081	86.5473	25.5350	4.1540	0.0000	0.0000	0.0000	0.0000	35.3115	123.6711	211.9327	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	201.4873	139.4081	86.5473	25.5350	4.1540	0.0000	0.0000	0.0000	0.0000	35.3115	123.6711	211.9327	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	56.0906	49.5444	52.4677	45.7160	44.0379	39.3783	38.6350	40.3333	40.9591	46.0383	49.4029	55.4222	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1263	7.3399	8.1263	7.8642	8.1263	7.8642	8.1263	8.1263	7.8642	8.1263	7.8642	8.1263	(231)
Lighting	15.7379	12.6255	11.3679	8.3286	6.4332	5.2560	5.8686	7.6282	9.9083	13.0003	14.6838	16.1753	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	828.0468	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	558.0255	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	95.6807	(230a)
Total electricity for the above, kWh/year	95.6807	(231)
Electricity for lighting (calculated in Appendix L)	127.0136	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1608.7667	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	828.0468	16.4900	136.5449	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	558.0255	16.4900	92.0184	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	95.6807	16.4900	15.7778	(249)
Energy for lighting	127.0136	16.4900	20.9445	(250)
Additional standing charges			0.0000	(251)
Total energy cost			265.2856	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9810	(257)
SAP value		84.0976	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	828.0468	0.1577	130.6110	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	558.0255	0.1411	78.7309	(264)
Space and water heating			209.3419	(265)
Pumps, fans and electric keep-hot	95.6807	0.1387	13.2721	(267)
Energy for lighting	127.0136	0.1443	18.3320	(268)
Total CO2, kg/year			240.9460	(272)
CO2 emissions per m2			4.6000	(273)
EI value			96.6834	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.3500	(1b) x	2.5500	(2b) =	133.4925	(1b) - (3b)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 52.3500 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 133.4925 (5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5600	(17)
Infiltration rate		0.1280	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1088	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1170	0.1115	0.1115	0.1034	0.1061	0.0925	0.0925	0.0898	0.0925	0.1034	0.1006	0.1088	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2530	0.2475	0.2475	0.2394	0.2421	0.2285	0.2285	0.2258	0.2285	0.2394	0.2366	0.2448	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			11.9200	1.2357	14.7300			(27)
Brickwork	31.4100	11.9200	19.4900	0.2100	4.0929	110.0000	2143.9000	(29a)
Communal Wall	18.1100	2.0600	16.0500	0.2200	3.5310	110.0000	1765.5001	(29a)
Smoke Shaft Wall	3.9300		3.9300	0.2200	0.8646	110.0000	432.3000	(29a)
Terrace Roof	5.9300		5.9300	0.1400	0.8302	9.0000	53.3700	(30)
Total net area of external elements Aum(A, m2)			59.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5207			(33)
Main dwelling								
Party Wall 1			34.9400	0.0000	0.0000	110.0000	3843.3998	(32)
Party Floor 1			52.3500			70.0000	3664.5000	(32d)
Party Ceiling 1			46.4200			30.0000	1392.6000	(32b)
Internal Wall 1			91.4400			9.0000	822.9600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14118.5299	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	269.6949	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.3100	0.0380	0.9998
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.2600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9800	0.0500	0.2990
E4 Jamb	13.6900	0.0160	0.2190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.6500	0.3300	1.2045
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E15 Flat roof with parapet	6.8200	0.3000	2.0460
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.9616	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 34.4823	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.1435	10.9039	10.9039	10.5444	10.6642	10.0651	10.0651	9.9453	10.0651	10.5444	10.4246	10.7841	(38)
Heat transfer coeff	45.6259	45.3862	45.3862	45.0268	45.1466	44.5475	44.5475	44.4276	44.5475	45.0268	44.9069	45.2664	(39)
Average = Sum(39)m / 12 =												44.9868	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8716	0.8670	0.8670	0.8601	0.8624	0.8510	0.8510	0.8487	0.8510	0.8601	0.8578	0.8647	(40)
HLP (average)												0.8593	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7594	(42)

Hot water usage for mixer showers

53.7188	52.9115	51.7351	49.4843	47.8233	45.9709	44.9181	46.0855	47.3653	49.3542	51.6533	53.5130	(42a)

Hot water usage for baths

23.2241	22.8792	22.3934	21.4979	20.8273	20.0837	19.6821	20.1644	20.6896	21.4852	22.3992	23.1456	(42b)

Hot water usage for other uses

32.6480	31.4608	30.2736	29.0864	27.8992	26.7120	26.7120	27.8992	29.0864	30.2736	31.4608	32.6480	(42c)

Average daily hot water use (litres/day)	100.7393	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.5908	107.2514	104.4021	100.0686	96.5498	92.7667	91.3122	94.1491	97.1412	101.1130	105.5133	109.3065	(44)
Energy conte	173.5651	152.7246	160.4622	136.9889	129.9746	114.0674	110.4341	116.5763	119.7849	137.2093	150.3230	171.1475	(45)
Energy content (annual)											Total = Sum(45)m =	1673.2580	
Distribution loss (46)m = 0.15 x (45)m													
	26.0348	22.9087	24.0693	20.5483	19.4962	17.1101	16.5651	17.4864	17.9677	20.5814	22.5485	25.6721	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(64)
										Total per year (kWh/year) = Sum(64)m =		2018.1830	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.7104	50.7809	53.3537	45.5488	43.2165	37.9274	36.7193	38.7616	39.8285	45.6221	49.9824	56.9066	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	105.5637	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.9801	15.9698	12.9875	9.8324	7.3498	6.2050	6.7047	8.7151	11.6973	14.8525	17.3350	18.4798	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	228.8560	231.2308	225.2464	212.5062	196.4240	181.3091	171.2113	168.8365	174.8210	187.5611	203.6433	218.7583	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	47.3158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	-70.3758	(71)
Water heating gains (Table 5)													
	77.5677	75.5669	71.7119	63.2622	58.0868	52.6770	49.3540	52.0989	55.3173	61.3200	69.4200	76.4873	(72)
Total internal gains													
	406.9075	405.2711	392.4495	368.1045	344.3643	322.6947	309.7737	312.1542	324.3393	346.2373	372.9020	396.2291	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9200	23.8018	0.3100	0.0000	0.7700	67.7233	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	67.7233	115.7162	188.8453	278.8875	332.3940	359.6928	339.1559	299.1036	233.8898	147.2933	83.1819	56.0131	(83)
Total gains	474.6308	520.9873	581.2948	646.9920	676.7583	682.3875	648.9297	611.2578	558.2291	493.5306	456.0839	452.2422	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.9559	86.4098	86.4098	87.0996	86.8685	88.0368	88.0368	88.2742	88.0368	87.0996	87.3320	86.6385	
alpha	6.7304	6.7607	6.7607	6.8066	6.7912	6.8691	6.8691	6.8849	6.8691	6.8066	6.8221	6.7759	
util living area													
	0.9793	0.9599	0.8957	0.7375	0.5365	0.3393	0.2265	0.2471	0.4772	0.8019	0.9525	0.9836	(86)
MIT	20.4724	20.6063	20.8044	20.9541	20.9947	20.9998	21.0000	21.0000	20.9982	20.9351	20.6969	20.4428	(87)
Th 2	20.1917	20.1957	20.1957	20.2015	20.1996	20.2094	20.2094	20.2114	20.2094	20.2015	20.2035	20.1976	(88)
util rest of house													
	0.9731	0.9486	0.8707	0.6942	0.4851	0.2878	0.1723	0.1898	0.4151	0.7532	0.9371	0.9785	(89)
MIT 2	19.6028	19.7701	20.0017	20.1632	20.1962	20.2093	20.2094	20.2114	20.2085	20.1492	19.8894	19.5711	(90)
Living area fraction										fLA = Living area / (4) =		0.4577	(91)
MIT	20.0008	20.1528	20.3691	20.5252	20.5617	20.5711	20.5712	20.5723	20.5700	20.5089	20.2590	19.9701	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0008	20.1528	20.3691	20.5252	20.5617	20.5711	20.5712	20.5723	20.5700	20.5089	20.2590	19.9701	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9713	0.9479	0.8765	0.7122	0.5085	0.3114	0.1971	0.2160	0.4435	0.7728	0.9383	0.9768	(94)
Useful gains	461.0266	493.8659	509.5234	460.7716	344.1177	212.4928	127.9049	132.0495	247.6011	381.3813	427.9600	441.7401	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	679.8633	655.9602	588.6180	478.4172	345.9000	212.5412	127.9064	132.0523	248.1274	405.6412	550.5135	673.1154	(97)
Space heating kWh													
	162.8145	108.9273	58.8463	12.7049	1.3260	0.0000	0.0000	0.0000	0.0000	18.0494	88.2385	172.1432	(98a)
Space heating requirement - total per year (kWh/year)												623.0501	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	162.8145	108.9273	58.8463	12.7049	1.3260	0.0000	0.0000	0.0000	0.0000	18.0494	88.2385	172.1432 (98c)

Space heating requirement after solar contribution - total per year (kWh/year) 623.0501

Space heating per m2 (98c) / (4) = 11.9016 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	162.8145	108.9273	58.8463	12.7049	1.3260	0.0000	0.0000	0.0000	0.0000	18.0494	88.2385	172.1432	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	162.8145	108.9273	58.8463	12.7049	1.3260	0.0000	0.0000	0.0000	0.0000	18.0494	88.2385	172.1432	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	202.8601	179.1846	189.7572	165.3389	159.2696	142.4174	139.7291	145.8713	148.1349	166.5043	178.6730	200.4425	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	56.0906	49.5444	52.4677	45.7160	44.0379	39.3783	38.6350	40.3333	40.9591	46.0383	49.4029	55.4222	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1263	7.3399	8.1263	7.8642	8.1263	7.8642	8.1263	8.1263	7.8642	8.1263	7.8642	8.1263	(231)
Lighting	15.7379	12.6255	11.3679	8.3286	6.4332	5.2560	5.8686	7.6282	9.9083	13.0003	14.6838	16.1753	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 623.0501 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 558.0255 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 95.6807 (230a)
Total electricity for the above, kWh/year 95.6807 (231)
Electricity for lighting (calculated in Appendix L) 127.0136 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1403.7699 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	623.0501	27.6700	172.3980	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	558.0255	27.6700	154.4057	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	95.6807	27.6700	26.4749	(249)
Energy for lighting	127.0136	27.6700	35.1447	(250)
Additional standing charges			0.0000	(251)
Total energy cost			388.4231	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	623.0501	0.1586	98.8005	(261)

Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	558.0255	0.1411	78.7309	(264)
Space and water heating			177.5314	(265)
Pumps, fans and electric keep-hot	95.6807	0.1387	13.2721	(267)
Energy for lighting	127.0136	0.1443	18.3320	(268)
Total CO2, kg/year			209.1355	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	623.0501	1.5870	988.7708	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	558.0255	1.5217	849.1490	(278)
Space and water heating			1837.9198	(279)
Pumps, fans and electric keep-hot	95.6807	1.5128	144.7458	(281)
Energy for lighting	127.0136	1.5338	194.8176	(282)
Total Primary energy kWh/year			2177.4833	(286)

Summary for Input Data

Plot Reference	P-15	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-15
Plot Address	Flat 10, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	87 B	**DER**	3.49	**TER**	11.98
Environmental	97 A	**% DER < TER**			70.87
CO_2 Emissions (t/year)	0.2	**DFEE**	27.78	**TFEE**	29.77
Compliance Check	See BREL	**% DFEE < TFEE**			6.68
% DPER < TPER	42.75	**DPER**	36.32	**TPER**	63.44

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	20.99 m	71.60 m²	2.55 m

8.0 Living Area	26.30	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	33.37	22.50	0.00	None	10.87	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	22.06	19.91	0.50	Stairwell Access Corridor 1	2.15	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	11.30	11.30	0.70	Stairwell Access Corridor 3	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	43.43	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	192.61

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	71.55

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete planks floor, screed, carpeted	40.00	71.55

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	East	2.15	
Patio Door	Patio Door	Brickwork	West	5.42	
West	Window	Brickwork	West	5.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	38.39	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	11.70	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	27.32	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	2.59	0.33	0.33	Abbey Calculated	No
E2 Other lintels (including other steel lintels)	Independently assessed	5.55	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.60	0.02	0.02	RCD	Yes
E20 Exposed floor (normal)	Independently assessed	0.00	0.12	0.12	-	No
E16 Corner (normal)	Gov Approved Scheme	8.55	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.85	-0.10	-0.10	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0

Summary for Input Data

elmhurst energy

Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.18	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

Summary for Input Data

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-15	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-15
Plot Address	Flat 10, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	87 B	**DER**	3.49	**TER**	11.98
Environmental	97 A	**% DER < TER**			70.87
CO_2 Emissions (t/year)	0.2	**DFEE**	27.78	**TFEE**	29.77
Compliance Check	See BREL	**% DFEE < TFEE**			6.68
% DPER < TPER	42.75	**DPER**	36.32	**TPER**	63.44

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		71.6000	(1b)	x 2.5500	(2b) =	182.5800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.5800	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.1800 (17)
Infiltration rate			0.1090 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.0927 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1181	0.1158	0.1135	0.1019	0.0996	0.0880	0.0880	0.0857	0.0927	0.0996	0.1042	0.1089	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

Effective ac	0.2541	0.2518	0.2495	0.2379	0.2356	0.2240	0.2240	0.2217	0.2287	0.2356	0.2402	0.2449	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	33.3700	10.8700	22.5000	0.2100	4.7250	110.0000	2474.9999	(29a)
Communal Wall	22.0600	2.1500	19.9100	0.2200	4.3802	110.0000	2190.0999	(29a)
Lift Shaft Wall	11.3000		11.3000	0.2100	2.3730	110.0000	1243.0000	(29a)
Total net area of external elements Aum(A, m2)			66.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5048			(33)
Main dwelling								
Party Wall 1			43.4300	0.0000	0.0000	110.0000	4777.3000	(32)
Party Floor 1			71.5500			40.0000	2862.0000	(32d)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			192.6100			9.0000	1733.4900	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			17427.3899	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 243.3993 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.3900	0.0380	1.4588
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0160	0.2976
E20 Exposed floor (normal)	0.0000	0.1200	0.0000
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3508 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 32.8556 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3116	15.1721	15.0325	14.3347	14.1952	13.4974	13.4974	13.3578	13.7765	14.1952	14.4743	14.7534	(38)
Heat transfer coeff	48.1672	48.0276	47.8881	47.1903	47.0507	46.3530	46.3530	46.2134	46.6321	47.0507	47.3299	47.6090	(39)

Average = Sum(39)m / 12 = 47.1554

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6727	0.6708	0.6688	0.6591	0.6571	0.6474	0.6474	0.6454	0.6513	0.6571	0.6610	0.6649	(40)
HLP (average)												0.6586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2843 (42)

Hot water usage for mixer showers

62.5204	61.5809	60.2117	57.5922	55.6590	53.5031	52.2777	53.6365	55.1260	57.4407	60.1165	62.2809	(42a)

Hot water usage for baths

27.0091	26.6079	26.0431	25.0016	24.2217	23.3569	22.8898	23.4508	24.0615	24.9868	26.0498	26.9177	(42b)

Hot water usage for other uses

38.0239	36.6412	35.2585	33.8758	32.4931	31.1104	31.1104	32.4931	33.8758	35.2585	36.6412	38.0239	(42c)

Average daily hot water use (litres/day) 117.2505 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5533	124.8300	121.5133	116.4695	112.3738	107.9705	106.2780	109.5804	113.0632	117.6860	122.8075	127.2225	(44)
Energy conte	202.0133	177.7562	186.7614	159.4410	151.2767	132.7623	128.5340	135.6834	139.4183	159.6988	174.9618	199.1997	(45)
Energy content (annual)										Total = Sum(45)m =		1947.5069	
Distribution loss (46)m = 0.15 x (45)m	30.3020	26.6634	28.0142	23.9161	22.6915	19.9143	19.2801	20.3525	20.9127	23.9548	26.2443	29.8800	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)

Total per year (kWh/year) = Sum(64)m = 2292.4319 (64)

12Total per year (kWh/year) 2292 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

67.1694	59.1039	62.0982	53.0141	50.2995	44.1435	42.7376	45.1147	46.3566	53.0998	58.1748	66.2339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9024	118.3563	106.9024	110.4658	106.9024	110.4658	106.9024	106.9024	110.4658	106.9024	110.4658	106.9024	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.0022	203.0879	197.8319	186.6423	172.5174	159.2421	150.3734	148.2876	153.5437	164.7332	178.8581	192.1334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)	90.2815	87.9523	83.4653	73.6307	67.6069	61.3104	57.4430	60.6381	64.3841	71.3708	80.7983	89.0240	(72)
Total internal gains	455.4511	466.6615	445.4646	428.0038	404.2917	388.2833	371.9838	373.0931	385.6586	400.2714	427.3872	445.3249	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)

West				5.4500		19.6403		0.3300		0.0000		0.7700	27.1987 (80)
Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107 (83)	
Total gains	509.6988	572.7815	620.2292	682.8876	716.6614	708.0492	676.4139	634.5941	588.9171	526.1918	495.0278	489.9356 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	100.5029	100.7949	101.0887	102.5834	102.8877	104.4365	104.4365	104.7519	103.8114	102.8877	102.2809	101.6813	
alpha	7.7002	7.7197	7.7392	7.8389	7.8592	7.9624	7.9624	7.9835	7.9208	7.8592	7.8187	7.7788	
util living area	0.9889	0.9724	0.9290	0.7937	0.6056	0.4187	0.3015	0.3350	0.5443	0.8524	0.9708	0.9913	(86)
MIT	20.4960	20.6370	20.8015	20.9513	20.9940	20.9997	21.0000	21.0000	20.9979	20.9313	20.7018	20.4720	(87)
Th 2	20.3650	20.3667	20.3684	20.3771	20.3789	20.3875	20.3875	20.3893	20.3841	20.3789	20.3754	20.3719	(88)
util rest of house	0.9859	0.9657	0.9135	0.7625	0.5668	0.3788	0.2595	0.2905	0.4966	0.8194	0.9625	0.9890	(89)
MIT 2	19.7808	19.9581	20.1582	20.3320	20.3743	20.3874	20.3875	20.3893	20.3828	20.3163	20.0477	19.7564	(90)
Living area fraction										fLA = Living area / (4) =		0.3673	(91)
MIT	20.0435	20.2074	20.3945	20.5595	20.6019	20.6123	20.6125	20.6136	20.6087	20.5422	20.2879	20.0193	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0435	20.2074	20.3945	20.5595	20.6019	20.6123	20.6125	20.6136	20.6087	20.5422	20.2879	20.0193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9841	0.9637	0.9142	0.7719	0.5808	0.3935	0.2750	0.3068	0.5141	0.8285	0.9612	0.9874	(94)
Useful gains	501.6017	552.0027	566.9846	527.1358	416.2634	278.5871	185.9864	194.7132	302.7427	435.9730	475.8221	483.7545	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	758.3212	735.1797	665.3794	550.2129	418.8407	278.6879	185.9911	194.7240	303.5164	467.7889	624.1826	753.1388	(97)
Space heating kWh	190.9994	123.0949	73.2057	16.6155	1.9175	0.0000	0.0000	0.0000	0.0000	23.6711	106.8196	200.4219	(98a)
Space heating requirement - total per year (kWh/year)												736.7456	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	190.9994	123.0949	73.2057	16.6155	1.9175	0.0000	0.0000	0.0000	0.0000	23.6711	106.8196	200.4219	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.7456	
Space heating per m2											(98c) / (4) =	10.2897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	190.9994	123.0949	73.2057	16.6155	1.9175	0.0000	0.0000	0.0000	0.0000	23.6711	106.8196	200.4219	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	190.9994	123.0949	73.2057	16.6155	1.9175	0.0000	0.0000	0.0000	0.0000	23.6711	106.8196	200.4219	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	63.9565	56.4656	59.7394	51.9240	49.9279	44.5474	43.6396	45.6164	46.3878	52.2566	56.2155	63.1785	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.1145	10.0389	11.1145	10.7560	11.1145	10.7560	11.1145	11.1145	10.7560	11.1145	10.7560	11.1145	(231)
Lighting	21.7582	17.4552	15.7165	11.5146	8.8942	7.2666	8.1136	10.5463	13.6987	17.9734	20.3009	22.3629	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												736.7456	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	361.6650	
Water heating fuel used	633.8551	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	130.8642	(230a)
Total electricity for the above, kWh/year	130.8642	(231)
Electricity for lighting (calculated in Appendix L)	175.6012	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1677.0661	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	736.7456	0.1584	116.6755	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.8551	0.1411	89.4667	(264)
Space and water heating			206.1422	(265)
Pumps, fans and electric keep-hot	130.8642	0.1387	18.1525	(267)
Energy for lighting	175.6012	0.1443	25.3447	(268)
Total CO2, kg/year			249.6393	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	736.7456	1.5862	1168.6338	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.8551	1.5219	964.6782	(278)
Space and water heating			2133.3120	(279)
Pumps, fans and electric keep-hot	130.8642	1.5128	197.9714	(281)
Energy for lighting	175.6012	1.5338	269.3430	(282)
Total Primary energy kWh/year			2600.6264	(286)
Dwelling Primary energy Rate (DPER)			36.3200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.6000	(1b)	x 2.5500	(2b) =	182.5800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		182.5800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1643	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4143	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3522	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4490	0.4402	0.4314	0.3874	0.3786	0.3346	0.3346	0.3258	0.3522	0.3786	0.3962	0.4138	(22b)

Effective ac	0.6008	0.5969	0.5931	0.5750	0.5717	0.5560	0.5560	0.5531	0.5620	0.5717	0.5785	0.5856 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
Brickwork	33.3700	10.8700	22.5000	0.1800	4.0500			(29a)
Communal Wall	22.0600	2.1500	19.9100	0.1800	3.5838			(29a)
Lift Shaft Wall	11.3000		11.3000	0.1800	2.0340			(29a)
Total net area of external elements Aum(A, m2)			66.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2644			(33)
Main dwelling								
Party Wall 1			43.4300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	243.3993	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.3900	0.0700	2.6873
E18 Party wall between dwellings	11.7000	0.0600	0.7020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.0200	0.0518
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0500	0.9300
E20 Exposed floor (normal)	0.0000	0.3200	0.0000
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.2526	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	33.5170	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1993	35.9635	35.7323	34.6465	34.4433	33.4976	33.4976	33.3225	33.8619	34.4433	34.8543	35.2840	(38)
Heat transfer coeff	69.7163	69.4805	69.2493	68.1635	67.9603	67.0146	67.0146	66.8394	67.3789	67.9603	68.3713	68.8009	(39)
Average = Sum(39)m / 12 =												68.1625	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9737	0.9704	0.9672	0.9520	0.9492	0.9360	0.9360	0.9335	0.9410	0.9492	0.9549	0.9609	(40)
HLP (average)												0.9520	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2843	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.5204	61.5809	60.2117	57.5922	55.6590	53.5031	52.2777	53.6365	55.1260	57.4407	60.1165	62.2809	(42a)

Hot water usage for baths

27.0091	26.6079	26.0431	25.0016	24.2217	23.3569	22.8898	23.4508	24.0615	24.9868	26.0498	26.9177	(42b)

Hot water usage for other uses

38.0239	36.6412	35.2585	33.8758	32.4931	31.1104	31.1104	32.4931	33.8758	35.2585	36.6412	38.0239	(42c)

Average daily hot water use (litres/day)	117.2505	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5533	124.8300	121.5133	116.4695	112.3738	107.9705	106.2780	109.5804	113.0632	117.6860	122.8075	127.2225	(44)
Energy conte	202.0133	177.7562	186.7614	159.4410	151.2767	132.7623	128.5340	135.6834	139.4183	159.6988	174.9618	199.1997	(45)
Energy content (annual)										Total = Sum(45)m =		1947.5069	
Distribution loss (46)m = 0.15 x (45)m	30.3020	26.6634	28.0142	23.9161	22.6915	19.9143	19.2801	20.3525	20.9127	23.9548	26.2443	29.8800	(46)

Water storage loss (or HIU loss):		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.7527	(55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

248.6082	219.8419	233.3563	204.5328	197.8716	177.8542	175.1289	182.2783	184.5101	206.2937	220.0536	245.7946	(62)
WWHRS -28.5817	-25.2779	-26.4696	-21.9179	-20.4267	-17.4792	-16.3840	-17.4227	-18.0847	-21.3199	-24.1528	-28.0524	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

220.0265	194.5640	206.8867	182.6150	177.4450	160.3749	158.7450	164.8556	166.4254	184.9738	195.9008	217.7421	(64)
								Total per year (kWh/year) = Sum(64)m =			2230.5549	(64)
12Total per year (kWh/year)											2231	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							0.0000	(64a)

Heat gains from water heating, kWh/month

104.4453	92.7725	99.3741	89.0876	87.5754	80.2169	80.0135	82.3907	82.4301	90.3758	94.2483	103.5098	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9024	118.3563	106.9024	110.4658	106.9024	110.4658	106.9024	106.9024	110.4658	106.9024	110.4658	106.9024	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.0022	203.0879	197.8319	186.6423	172.5174	159.2421	150.3734	148.2876	153.5437	164.7332	178.8581	192.1334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)													
	140.3835	138.0543	133.5673	123.7328	117.7089	111.4124	107.5450	110.7401	114.4862	121.4728	130.9004	139.1261	(72)
Total internal gains													
	508.5531	519.7635	498.5666	481.1059	457.3938	438.3854	422.0858	423.1951	435.7607	453.3735	480.4893	498.4269	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	10.8700	19.6403	0.6300	0.7000	0.7700	65.2452	(80)

Solar gains	65.2452	127.6335	210.1942	306.5557	375.6955	384.5912	366.1465	314.5144	244.4645	151.4479	81.3531	53.6545	(83)
Total gains	573.7983	647.3970	708.7608	787.6616	833.0893	822.9765	788.2323	737.7095	680.2252	604.8214	561.8424	552.0814	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4377	69.6734	69.9060	71.0196	71.2319	72.2371	72.2371	72.4264	71.8466	71.2319	70.8037	70.3616	
alpha	5.6292	5.6449	5.6604	5.7346	5.7488	5.8158	5.8158	5.8284	5.7898	5.7488	5.7202	5.6908	
util living area													
	0.9905	0.9803	0.9546	0.8704	0.7144	0.5154	0.3733	0.4153	0.6576	0.9094	0.9792	0.9921	(86)
MIT	20.0579	20.2343	20.4815	20.7790	20.9414	20.9925	20.9990	20.9983	20.9720	20.7510	20.3650	20.0363	(87)
Th 2	20.1053	20.1081	20.1108	20.1235	20.1259	20.1370	20.1370	20.1391	20.1328	20.1259	20.1211	20.1160	(88)
util rest of house													
	0.9877	0.9746	0.9419	0.8388	0.6603	0.4485	0.3005	0.3384	0.5850	0.8792	0.9722	0.9898	(89)
MIT 2	19.0197	19.2440	19.5523	19.9110	20.0800	20.1330	20.1367	20.1385	20.1153	19.8902	19.4206	19.0004	(90)
Living area fraction									fLA = Living area / (4) =			0.3673	(91)
MIT	19.4010	19.6077	19.8936	20.2298	20.3964	20.4487	20.4535	20.4543	20.4300	20.2064	19.7675	19.3809	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4010	19.6077	19.8936	20.2298	20.3964	20.4487	20.4535	20.4543	20.4300	20.2064	19.7675	19.3809	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9848	0.9707	0.9383	0.8430	0.6776	0.4729	0.3273	0.3667	0.6106	0.8823	0.9687	0.9873	(94)
Useful gains	565.0719	628.4464	664.9980	663.9898	564.5361	389.1845	257.9749	270.4864	415.3760	533.6500	544.2823	545.0695	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1052.7867	1021.9008	927.4985	772.2805	591.0091	391.9484	258.2387	270.9871	426.5069	652.8543	866.0945	1044.4615	(97)
Space heating kWh													
	362.8598	264.4014	195.3004	77.9693	19.6959	0.0000	0.0000	0.0000	0.0000	88.6880	231.7048	371.5477	(98a)
Space heating requirement - total per year (kWh/year)												1612.1673	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	362.8598	264.4014	195.3004	77.9693	19.6959	0.0000	0.0000	0.0000	0.0000	88.6880	231.7048	371.5477	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1612.1673	
Space heating per m2										(98c) / (4) =		22.5163	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	362.8598	264.4014	195.3004	77.9693	19.6959	0.0000	0.0000	0.0000	0.0000	88.6880	231.7048	371.5477	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	393.1309	286.4587	211.5931	84.4738	21.3390	0.0000	0.0000	0.0000	0.0000	96.0867	251.0344	402.5435	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	220.0265	194.5640	206.8867	182.6150	177.4450	160.3749	158.7450	164.8556	166.4254	184.9738	195.9008	217.7421	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1739	84.7482	83.9307	82.2956	80.6163	79.8000	79.8000	79.8000	79.8000	82.5101	84.4372	85.2475	(217)
Fuel for water heating, kWh/month													
	258.3261	229.5791	246.4971	221.9011	220.1105	200.9711	198.9285	206.5859	208.5532	224.1832	232.0077	255.4235	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2122	17.8195	16.0444	11.7549	9.0798	7.4183	8.2829	10.7664	13.9845	18.3484	20.7245	22.8296	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.1846	-28.4211	-42.9020	-50.7355	-56.9029	-53.9179	-53.2653	-49.2004	-42.4070	-33.5959	-21.5759	-16.4301	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.0246	-15.0946	-30.6024	-46.8558	-62.8363	-63.4584	-62.7068	-52.6825	-38.0819	-21.8704	-9.4691	-5.5310	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1746.6601	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2703.0671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.2653	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-884.7523	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3830.2401	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1746.6601	0.2100	366.7986	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2703.0671	0.2100	567.6441	(264)
Space and water heating			934.4427	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.2653	0.1443	25.8735	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-468.5384	0.1336	-62.5766	
PV Unit electricity exported	-416.2139	0.1253	-52.1671	
Total			-114.7438	(269)
Total CO2, kg/year			857.5017	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1746.6601	1.1300	1973.7259	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2703.0671	1.1300	3054.4658	(278)
Space and water heating			5028.1917	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.2653	1.5338	274.9631	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-468.5384	1.4935	-699.7836	
PV Unit electricity exported	-416.2139	0.4600	-191.4782	
Total			-891.2618	(283)
Total Primary energy kWh/year			4541.9937	(286)
Target Primary Energy Rate (TPER)			63.4400	(287)

Full SAP Calculation Printout

Plot Reference	P-15	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-15
Plot Address	Flat 10, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	87 B	**DER**	3.49	**TER**	11.98
Environmental	97 A	**% DER < TER**			70.87
CO_2 Emissions (t/year)	0.2	**DFEE**	27.78	**TFEE**	29.77
Compliance Check	See BREL	**% DFEE < TFEE**			6.68
% DPER < TPER	42.75	**DPER**	36.32	**TPER**	63.44

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.6000 (1b)	x	2.5500 (2b)	=	182.5800	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.5800	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1643	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.1800	(17)
Infiltration rate		0.2733	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2323	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2962	0.2904	0.2846	0.2555	0.2497	0.2207	0.2207	0.2149	0.2323	0.2497	0.2614	0.2730	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5439	0.5422	0.5405	0.5327	0.5312	0.5244	0.5244	0.5231	0.5270	0.5312	0.5342	0.5373	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	33.3700	10.8700	22.5000	0.2100	4.7250	110.0000	2474.9999	(29a)
Communal Wall	22.0600	2.1500	19.9100	0.2200	4.3802	110.0000	2190.0999	(29a)
Lift Shaft Wall	11.3000		11.3000	0.2100	2.3730	110.0000	1243.0000	(29a)
Total net area of external elements Aum(A, m2)			66.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5048			(33)
Main dwelling								
Party Wall 1			43.4300	0.0000	0.0000	110.0000	4777.3000	(32)
Party Floor 1			71.5500			40.0000	2862.0000	(32d)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			192.6100			9.0000	1733.4900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17427.3899 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	243.3993 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	38.3900	0.0380	1.4588	
E18 Party wall between dwellings	11.7000	0.0380	0.4446	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.3200	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547	
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775	
E4 Jamb	18.6000	0.0160	0.2976	
E20 Exposed floor (normal)	0.0000	0.1200	0.0000	
E16 Corner (normal)	8.5500	0.0540	0.4617	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.3508	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	32.8556	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.7688	32.6662	32.5655	32.0930	32.0046	31.5931	31.5931	31.5169	31.7516	32.0046	32.1835	32.3704	(38)
Heat transfer coeff	65.6244	65.5217	65.4211	64.9486	64.8602	64.4486	64.4486	64.3724	64.6072	64.8602	65.0390	65.2260	(39)
Average = Sum(39)m / 12 =												64.9482	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9165	0.9151	0.9137	0.9071	0.9059	0.9001	0.9001	0.8991	0.9023	0.9059	0.9084	0.9110	(40)
HLP (average)												0.9071	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2843 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.0091	26.6079	26.0431	25.0016	24.2217	23.3569	22.8898	23.4508	24.0615	24.9868	26.0498	26.9177	(42b)

Hot water usage for other uses

38.0239	36.6412	35.2585	33.8758	32.4931	31.1104	31.1104	32.4931	33.8758	35.2585	36.6412	38.0239	(42c)

Average daily hot water use (litres/day) 59.6088 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.0329	63.2491	61.3016	58.8774	56.7148	54.4674	54.0003	55.9439	57.9373	60.2453	62.6909	64.9416	(44)
Energy conte	102.9962	90.0659	94.2182	80.6002	76.3490	66.9740	65.3087	69.2702	71.4425	81.7523	89.3147	101.6829	(45)
Energy content (annual)										Total = Sum(45)m =		989.9748	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	87.5468	76.5560	80.0855	68.5101	64.8967	56.9279	55.5124	58.8797	60.7261	69.4894	75.9175	86.4304	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	87.5468	76.5560	80.0855	68.5101	64.8967	56.9279	55.5124	58.8797	60.7261	69.4894	75.9175	86.4304	(64)
									Total per year (kWh/year) = Sum(64)m =			841.4785	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)	50.0684	44.6114	48.7139	46.4871	47.3594	45.1763	46.6822	47.3594	46.4871	48.7139	47.7979	50.0684	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							569.5256	(64a)
Heat gains from water heating, kWh/month	34.4038	30.2918	32.1999	28.7493	28.0640	25.5260	25.5486	26.5598	26.8033	29.5508	30.9289	34.1247	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9024	118.3563	106.9024	110.4658	106.9024	110.4658	106.9024	106.9024	110.4658	106.9024	110.4658	106.9024	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.0022	203.0879	197.8319	186.6423	172.5174	159.2421	150.3734	148.2876	153.5437	164.7332	178.8581	192.1334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)	46.2417	45.0772	43.2794	39.9296	37.7205	35.4528	34.3396	35.6986	37.2268	39.7189	42.9568	45.8666	(72)
Total internal gains	411.4113	423.7864	405.2787	394.3027	374.4053	362.4258	348.8803	348.1536	358.5013	368.6195	389.5457	402.1674	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
West	5.4500	19.6403	0.3300	0.0000	0.7700	27.1987	(80)

Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107	(83)
Total gains	465.6590	529.9064	580.0433	649.1865	686.7750	682.1917	653.3105	609.6547	561.7598	494.5399	457.1862	446.7781	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.7674	73.8830	73.9966	74.5350	74.6365	75.1132	75.1132	75.2021	74.9289	74.6365	74.4313	74.2179	
alpha	5.9178	5.9255	5.9331	5.9690	5.9758	6.0075	6.0075	6.0135	5.9953	5.9758	5.9621	5.9479	
util living area	0.9964	0.9915	0.9783	0.9245	0.7957	0.5926	0.4324	0.4824	0.7425	0.9528	0.9914	0.9971	(86)
MIT	19.9898	20.1534	20.3904	20.7026	20.9091	20.9869	20.9983	20.9968	20.9540	20.6743	20.2783	19.9594	(87)
Th 2	20.1535	20.1547	20.1559	20.1615	20.1625	20.1674	20.1674	20.1683	20.1655	20.1625	20.1604	20.1582	(88)
util rest of house	0.9952	0.9889	0.9715	0.9023	0.7460	0.5207	0.3515	0.3969	0.6711	0.9340	0.9884	0.9963	(89)
MIT 2	19.2312	19.3944	19.6283	19.9282	20.1040	20.1616	20.1669	20.1674	20.1417	19.9089	19.5239	19.2048	(90)
Living area fraction										fLA = Living area / (4) =		0.3673	(91)
MIT	19.5099	19.6732	19.9082	20.2126	20.3997	20.4647	20.4723	20.4720	20.4400	20.1901	19.8010	19.4820	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5099	19.6732	19.9082	20.2126	20.3997	20.4647	20.4723	20.4720	20.4400	20.1901	19.8010	19.4820	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9941	0.9871	0.9691	0.9038	0.7609	0.5468	0.3813	0.4284	0.6958	0.9348	0.9867	0.9953	(94)
Useful gains	462.9182	523.0493	562.1379	586.7219	522.5640	373.0410	249.0890	261.1915	390.8557	462.2841	451.0864	444.6858	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	998.1382	967.9654	877.1819	734.7386	564.2658	377.9742	249.5653	262.1274	409.6127	622.0140	826.0595	996.7817	(97)
Space heating kWh	398.2037	298.9836	234.3927	106.5720	31.0261	0.0000	0.0000	0.0000	0.0000	118.8390	269.9806	410.7594	(98a)
Space heating requirement - total per year (kWh/year)												1868.7571	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	398.2037	298.9836	234.3927	106.5720	31.0261	0.0000	0.0000	0.0000	0.0000	118.8390	269.9806	410.7594	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1868.7571	
Space heating per m2											(98c) / (4) =	26.1000	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	605.8173	476.9200	489.2305	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9323	0.9702	0.9549	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	564.8094	462.6842	467.1841	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	752.9105	721.3887	672.4882	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	135.4328	192.4762	152.7462	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.8582	48.1190	38.1866	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												120.1638	(107)
Energy for space heating												26.1000	(99)
Energy for space cooling												1.6783	(108)
Total												27.7782	(109)
Fabric Energy Efficiency (DFEE)												27.8	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.6000	(1b)	x 2.5500	(2b) =	182.5800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		182.5800	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1643	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4143	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3522	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4490	0.4402	0.4314	0.3874	0.3786	0.3346	0.3346	0.3258	0.3522	0.3786	0.3962	0.4138	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.6008	0.5969	0.5931	0.5750	0.5717	0.5560	0.5560	0.5531	0.5620	0.5717	0.5785	0.5856	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
Brickwork	33.3700	10.8700	22.5000	0.1800	4.0500			(29a)
Communal Wall	22.0600	2.1500	19.9100	0.1800	3.5838			(29a)
Lift Shaft Wall	11.3000		11.3000	0.1800	2.0340			(29a)
Total net area of external elements Aum(A, m2)			66.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2644			(33)
Main dwelling								
Party Wall 1			43.4300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	243.3993	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.3900	0.0700	2.6873
E18 Party wall between dwellings	11.7000	0.0600	0.7020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.0200	0.0518
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0500	0.9300
E20 Exposed floor (normal)	0.0000	0.3200	0.0000
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.2526	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	33.5170	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1993	35.9635	35.7323	34.6465	34.4433	33.4976	33.4976	33.3225	33.8619	34.4433	34.8543	35.2840	(38)
Heat transfer coeff													
	69.7163	69.4805	69.2493	68.1635	67.9603	67.0146	67.0146	66.8394	67.3789	67.9603	68.3713	68.8009	(39)
Average = Sum(39)m / 12 =												68.1625	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9737	0.9704	0.9672	0.9520	0.9492	0.9360	0.9360	0.9335	0.9410	0.9492	0.9549	0.9609	(40)
HLP (average)												0.9520	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2843	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	27.0091	26.6079	26.0431	25.0016	24.2217	23.3569	22.8898	23.4508	24.0615	24.9868	26.0498	26.9177	(42b)
Hot water usage for other uses													
	38.0239	36.6412	35.2585	33.8758	32.4931	31.1104	31.1104	32.4931	33.8758	35.2585	36.6412	38.0239	(42c)
Average daily hot water use (litres/day)												59.6088	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0329	63.2491	61.3016	58.8774	56.7148	54.4674	54.0003	55.9439	57.9373	60.2453	62.6909	64.9416	(44)
Energy conte	102.9962	90.0659	94.2182	80.6002	76.3490	66.9740	65.3087	69.2702	71.4425	81.7523	89.3147	101.6829	(45)
Energy content (annual)										Total = Sum(45)m =		989.9748	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5468	76.5560	80.0855	68.5101	64.8967	56.9279	55.5124	58.8797	60.7261	69.4894	75.9175	86.4304	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5468	76.5560	80.0855	68.5101	64.8967	56.9279	55.5124	58.8797	60.7261	69.4894	75.9175	86.4304	(64)
										Total per year (kWh/year) = Sum(64)m =		841.4785	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0684	44.6114	48.7139	46.4871	47.3594	45.1763	46.6822	47.3594	46.4871	48.7139	47.7979	50.0684	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.5256	(64a)

Heat gains from water heating, kWh/month

	34.4038	30.2918	32.1999	28.7493	28.0640	25.5260	25.5486	26.5598	26.8033	29.5508	30.9289	34.1247 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	106.9024	118.3563	106.9024	110.4658	106.9024	110.4658	106.9024	106.9024	110.4658	106.9024	110.4658	106.9024	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	201.0022	203.0879	197.8319	186.6423	172.5174	159.2421	150.3734	148.2876	153.5437	164.7332	178.8581	192.1334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)													
	46.2417	45.0772	43.2794	39.9296	37.7205	35.4528	34.3396	35.6986	37.2268	39.7189	42.9568	45.8666	(72)
Total internal gains													
	411.4113	423.7864	405.2787	394.3027	374.4053	362.4258	348.8803	348.1536	358.5013	368.6195	389.5457	402.1674	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	10.8700	19.6403	0.6300	0.7000	0.7700	65.2452	(80)

Solar gains	65.2452	127.6335	210.1942	306.5557	375.6955	384.5912	366.1465	314.5144	244.4645	151.4479	81.3531	53.6545	(83)
Total gains	476.6565	551.4198	615.4728	700.8584	750.1008	747.0170	715.0268	662.6680	602.9658	520.0674	470.8988	455.8219	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4377	69.6734	69.9060	71.0196	71.2319	72.2371	72.2371	72.4264	71.8466	71.2319	70.8037	70.3616	
alpha	5.6292	5.6449	5.6604	5.7346	5.7488	5.8158	5.8158	5.8284	5.7898	5.7488	5.7202	5.6908	
util living area													
	0.9961	0.9906	0.9748	0.9113	0.7703	0.5642	0.4110	0.4611	0.7238	0.9482	0.9908	0.9970	(86)
MIT	19.9100	20.0945	20.3603	20.7046	20.9138	20.9882	20.9984	20.9970	20.9547	20.6606	20.2324	19.8884	(87)
Th 2	20.1053	20.1081	20.1108	20.1235	20.1259	20.1370	20.1370	20.1391	20.1328	20.1259	20.1211	20.1160	(88)
util rest of house													
	0.9949	0.9877	0.9670	0.8861	0.7178	0.4924	0.3311	0.3763	0.6501	0.9276	0.9875	0.9960	(89)
MIT 2	19.1130	19.2981	19.5609	19.8949	20.0715	20.1319	20.1366	20.1383	20.1097	19.8639	19.4463	19.1001	(90)
Living area fraction										fLA = Living area / (4) =		0.3673	(91)
MIT	19.4058	19.5906	19.8545	20.1923	20.3809	20.4464	20.4532	20.4537	20.4201	20.1565	19.7351	19.3896	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4058	19.5906	19.8545	20.1923	20.3809	20.4464	20.4532	20.4537	20.4201	20.1565	19.7351	19.3896	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9937	0.9855	0.9643	0.8883	0.7339	0.5186	0.3605	0.4076	0.6757	0.9285	0.9856	0.9950	(94)
Useful gains	473.6309	543.4439	593.4710	622.5922	550.4847	387.3750	257.7771	270.0721	407.4002	482.8793	464.1248	453.5258	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1053.1190	1020.7092	924.7905	769.7245	589.9585	391.7969	258.2189	270.9465	425.8380	649.4658	863.8764	1045.0621	(97)
Space heating kWh													
	431.1391	320.7223	246.5017	105.9353	29.3685	0.0000	0.0000	0.0000	0.0000	123.9403	287.8212	440.1030	(98a)
Space heating requirement - total per year (kWh/year)												1985.5313	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	431.1391	320.7223	246.5017	105.9353	29.3685	0.0000	0.0000	0.0000	0.0000	123.9403	287.8212	440.1030	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1985.5313	
Space heating per m2											(98c) / (4) =	27.7309	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	629.9370	495.9079	507.9798	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9424	0.9746	0.9609	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	593.6817	483.3144	488.1101	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	828.6803	793.5247	734.4519	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	169.1990	230.7964	183.2783	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	42.2997	57.6991	45.8196	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												145.8184	(107)
Energy for space heating												27.7309	(99)
Energy for space cooling												2.0366	(108)
Total												29.7675	(109)
Fabric Energy Efficiency (TFEE)												29.8	(109)

Full SAP Calculation Printout

Plot Reference	P-15	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-15
Plot Address	Flat 10, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	87 B	**DER**	3.49	**TER**	11.98
Environmental	97 A	**% DER < TER**			70.87
CO_2 Emissions (t/year)	0.2	**DFEE**	27.78	**TFEE**	29.77
Compliance Check	See BREL	**% DFEE < TFEE**			6.68
% DPER < TPER	42.75	**DPER**	36.32	**TPER**	63.44

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		71.6000	(1b)	x 2.5500	(2b) =	182.5800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.5800	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.1800 (17)
Infiltration rate			0.1090 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.0927 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1181	0.1158	0.1135	0.1019	0.0996	0.0880	0.0880	0.0857	0.0927	0.0996	0.1042	0.1089	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

Effective ac	0.2541	0.2518	0.2495	0.2379	0.2356	0.2240	0.2240	0.2217	0.2287	0.2356	0.2402	0.2449	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	33.3700	10.8700	22.5000	0.2100	4.7250	110.0000	2474.9999	(29a)
Communal Wall	22.0600	2.1500	19.9100	0.2200	4.3802	110.0000	2190.0999	(29a)
Lift Shaft Wall	11.3000		11.3000	0.2100	2.3730	110.0000	1243.0000	(29a)
Total net area of external elements Aum(A, m2)			66.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5048			(33)
Main dwelling								
Party Wall 1			43.4300	0.0000	0.0000	110.0000	4777.3000	(32)
Party Floor 1			71.5500			40.0000	2862.0000	(32d)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			192.6100			9.0000	1733.4900	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			17427.3899	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 243.3993 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.3900	0.0380	1.4588
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0160	0.2976
E20 Exposed floor (normal)	0.0000	0.1200	0.0000
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3508 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 32.8556 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3116	15.1721	15.0325	14.3347	14.1952	13.4974	13.4974	13.3578	13.7765	14.1952	14.4743	14.7534	(38)
Heat transfer coeff	48.1672	48.0276	47.8881	47.1903	47.0507	46.3530	46.3530	46.2134	46.6321	47.0507	47.3299	47.6090	(39)

Average = Sum(39)m / 12 = 47.1554

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6727	0.6708	0.6688	0.6591	0.6571	0.6474	0.6474	0.6454	0.6513	0.6571	0.6610	0.6649	(40)
HLP (average)												0.6586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2843 (42)

Hot water usage for mixer showers

62.5204	61.5809	60.2117	57.5922	55.6590	53.5031	52.2777	53.6365	55.1260	57.4407	60.1165	62.2809	(42a)

Hot water usage for baths

27.0091	26.6079	26.0431	25.0016	24.2217	23.3569	22.8898	23.4508	24.0615	24.9868	26.0498	26.9177	(42b)

Hot water usage for other uses

38.0239	36.6412	35.2585	33.8758	32.4931	31.1104	31.1104	32.4931	33.8758	35.2585	36.6412	38.0239	(42c)

Average daily hot water use (litres/day) 117.2505 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5533	124.8300	121.5133	116.4695	112.3738	107.9705	106.2780	109.5804	113.0632	117.6860	122.8075	127.2225	(44)
Energy conte	202.0133	177.7562	186.7614	159.4410	151.2767	132.7623	128.5340	135.6834	139.4183	159.6988	174.9618	199.1997	(45)
Energy content (annual)										Total = Sum(45)m =		1947.5069	
Distribution loss (46)m = 0.15 x (45)m	30.3020	26.6634	28.0142	23.9161	22.6915	19.9143	19.2801	20.3525	20.9127	23.9548	26.2443	29.8800	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)

Total per year (kWh/year) = Sum(64)m = 2292.4319 (64)

12Total per year (kWh/year) 2292 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

67.1694	59.1039	62.0982	53.0141	50.2995	44.1435	42.7376	45.1147	46.3566	53.0998	58.1748	66.2339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9024	118.3563	106.9024	110.4658	106.9024	110.4658	106.9024	106.9024	110.4658	106.9024	110.4658	106.9024	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.0022	203.0879	197.8319	186.6423	172.5174	159.2421	150.3734	148.2876	153.5437	164.7332	178.8581	192.1334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)	90.2815	87.9523	83.4653	73.6307	67.6069	61.3104	57.4430	60.6381	64.3841	71.3708	80.7983	89.0240	(72)
Total internal gains	455.4511	466.6615	445.4646	428.0038	404.2917	388.2833	371.9838	373.0931	385.6586	400.2714	427.3872	445.3249	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)

West				5.4500		19.6403		0.3300		0.0000		0.7700	27.1987 (80)
Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107 (83)	
Total gains	509.6988	572.7815	620.2292	682.8876	716.6614	708.0492	676.4139	634.5941	588.9171	526.1918	495.0278	489.9356 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	100.5029	100.7949	101.0887	102.5834	102.8877	104.4365	104.4365	104.7519	103.8114	102.8877	102.2809	101.6813	
alpha	7.7002	7.7197	7.7392	7.8389	7.8592	7.9624	7.9624	7.9835	7.9208	7.8592	7.8187	7.7788	
util living area	0.9889	0.9724	0.9290	0.7937	0.6056	0.4187	0.3015	0.3350	0.5443	0.8524	0.9708	0.9913	(86)
MIT	20.4960	20.6370	20.8015	20.9513	20.9940	20.9997	21.0000	21.0000	20.9979	20.9313	20.7018	20.4720	(87)
Th 2	20.3650	20.3667	20.3684	20.3771	20.3789	20.3875	20.3875	20.3893	20.3841	20.3789	20.3754	20.3719	(88)
util rest of house	0.9859	0.9657	0.9135	0.7625	0.5668	0.3788	0.2595	0.2905	0.4966	0.8194	0.9625	0.9890	(89)
MIT 2	19.7808	19.9581	20.1582	20.3320	20.3743	20.3874	20.3875	20.3893	20.3828	20.3163	20.0477	19.7564	(90)
Living area fraction										fLA = Living area / (4) =		0.3673	(91)
MIT	20.0435	20.2074	20.3945	20.5595	20.6019	20.6123	20.6125	20.6136	20.6087	20.5422	20.2879	20.0193	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0435	20.2074	20.3945	20.5595	20.6019	20.6123	20.6125	20.6136	20.6087	20.5422	20.2879	20.0193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9841	0.9637	0.9142	0.7719	0.5808	0.3935	0.2750	0.3068	0.5141	0.8285	0.9612	0.9874	(94)
Useful gains	501.6017	552.0027	566.9846	527.1358	416.2634	278.5871	185.9864	194.7132	302.7427	435.9730	475.8221	483.7545	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	758.3212	735.1797	665.3794	550.2129	418.8407	278.6879	185.9911	194.7240	303.5164	467.7889	624.1826	753.1388	(97)
Space heating kWh	190.9994	123.0949	73.2057	16.6155	1.9175	0.0000	0.0000	0.0000	0.0000	23.6711	106.8196	200.4219	(98a)
Space heating requirement - total per year (kWh/year)												736.7456	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	190.9994	123.0949	73.2057	16.6155	1.9175	0.0000	0.0000	0.0000	0.0000	23.6711	106.8196	200.4219	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.7456	
Space heating per m2											(98c) / (4) =	10.2897	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	190.9994	123.0949	73.2057	16.6155	1.9175	0.0000	0.0000	0.0000	0.0000	23.6711	106.8196	200.4219	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	190.9994	123.0949	73.2057	16.6155	1.9175	0.0000	0.0000	0.0000	0.0000	23.6711	106.8196	200.4219	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	63.9565	56.4656	59.7394	51.9240	49.9279	44.5474	43.6396	45.6164	46.3878	52.2566	56.2155	63.1785	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.1145	10.0389	11.1145	10.7560	11.1145	10.7560	11.1145	11.1145	10.7560	11.1145	10.7560	11.1145	(231)
Lighting	21.7582	17.4552	15.7165	11.5146	8.8942	7.2666	8.1136	10.5463	13.6987	17.9734	20.3009	22.3629	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												736.7456	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	361.6650	
Water heating fuel used	633.8551	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	130.8642	(230a)
Total electricity for the above, kWh/year	130.8642	(231)
Electricity for lighting (calculated in Appendix L)	175.6012	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1677.0661	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	736.7456	0.1584	116.6755	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.8551	0.1411	89.4667	(264)
Space and water heating			206.1422	(265)
Pumps, fans and electric keep-hot	130.8642	0.1387	18.1525	(267)
Energy for lighting	175.6012	0.1443	25.3447	(268)
Total CO2, kg/year			249.6393	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	736.7456	1.5862	1168.6338	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.8551	1.5219	964.6782	(278)
Space and water heating			2133.3120	(279)
Pumps, fans and electric keep-hot	130.8642	1.5128	197.9714	(281)
Energy for lighting	175.6012	1.5338	269.3430	(282)
Total Primary energy kWh/year			2600.6264	(286)
Dwelling Primary energy Rate (DPER)			36.3200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.6000	(1b)	x 2.5500	(2b) =	182.5800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		182.5800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1643	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4143	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3522	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4490	0.4402	0.4314	0.3874	0.3786	0.3346	0.3346	0.3258	0.3522	0.3786	0.3962	0.4138	(22b)

Effective ac	0.6008	0.5969	0.5931	0.5750	0.5717	0.5560	0.5560	0.5531	0.5620	0.5717	0.5785	0.5856 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
Brickwork	33.3700	10.8700	22.5000	0.1800	4.0500			(29a)
Communal Wall	22.0600	2.1500	19.9100	0.1800	3.5838			(29a)
Lift Shaft Wall	11.3000		11.3000	0.1800	2.0340			(29a)
Total net area of external elements Aum(A, m2)			66.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2644			(33)
Main dwelling								
Party Wall 1			43.4300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	243.3993	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.3900	0.0700	2.6873
E18 Party wall between dwellings	11.7000	0.0600	0.7020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.0200	0.0518
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0500	0.9300
E20 Exposed floor (normal)	0.0000	0.3200	0.0000
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.2526	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	33.5170	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1993	35.9635	35.7323	34.6465	34.4433	33.4976	33.4976	33.3225	33.8619	34.4433	34.8543	35.2840	(38)
Heat transfer coeff	69.7163	69.4805	69.2493	68.1635	67.9603	67.0146	67.0146	66.8394	67.3789	67.9603	68.3713	68.8009	(39)
Average = Sum(39)m / 12 =												68.1625	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9737	0.9704	0.9672	0.9520	0.9492	0.9360	0.9360	0.9335	0.9410	0.9492	0.9549	0.9609	(40)
HLP (average)												0.9520	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2843	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.5204	61.5809	60.2117	57.5922	55.6590	53.5031	52.2777	53.6365	55.1260	57.4407	60.1165	62.2809	(42a)

Hot water usage for baths

27.0091	26.6079	26.0431	25.0016	24.2217	23.3569	22.8898	23.4508	24.0615	24.9868	26.0498	26.9177	(42b)

Hot water usage for other uses

38.0239	36.6412	35.2585	33.8758	32.4931	31.1104	31.1104	32.4931	33.8758	35.2585	36.6412	38.0239	(42c)

Average daily hot water use (litres/day)	117.2505	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5533	124.8300	121.5133	116.4695	112.3738	107.9705	106.2780	109.5804	113.0632	117.6860	122.8075	127.2225	(44)
Energy conte	202.0133	177.7562	186.7614	159.4410	151.2767	132.7623	128.5340	135.6834	139.4183	159.6988	174.9618	199.1997	(45)
Energy content (annual)										Total = Sum(45)m =		1947.5069	
Distribution loss (46)m = 0.15 x (45)m	30.3020	26.6634	28.0142	23.9161	22.6915	19.9143	19.2801	20.3525	20.9127	23.9548	26.2443	29.8800	(46)

Water storage loss (or HIU loss):		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.7527	(55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

248.6082	219.8419	233.3563	204.5328	197.8716	177.8542	175.1289	182.2783	184.5101	206.2937	220.0536	245.7946	(62)
WWHRS -28.5817	-25.2779	-26.4696	-21.9179	-20.4267	-17.4792	-16.3840	-17.4227	-18.0847	-21.3199	-24.1528	-28.0524	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

220.0265	194.5640	206.8867	182.6150	177.4450	160.3749	158.7450	164.8556	166.4254	184.9738	195.9008	217.7421	(64)
								Total per year (kWh/year) = Sum(64)m =			2230.5549	(64)
12Total per year (kWh/year)											2231	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							0.0000	(64a)

Heat gains from water heating, kWh/month

104.4453	92.7725	99.3741	89.0876	87.5754	80.2169	80.0135	82.3907	82.4301	90.3758	94.2483	103.5098	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9024	118.3563	106.9024	110.4658	106.9024	110.4658	106.9024	106.9024	110.4658	106.9024	110.4658	106.9024	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.0022	203.0879	197.8319	186.6423	172.5174	159.2421	150.3734	148.2876	153.5437	164.7332	178.8581	192.1334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)													
	140.3835	138.0543	133.5673	123.7328	117.7089	111.4124	107.5450	110.7401	114.4862	121.4728	130.9004	139.1261	(72)
Total internal gains													
	508.5531	519.7635	498.5666	481.1059	457.3938	438.3854	422.0858	423.1951	435.7607	453.3735	480.4893	498.4269	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	10.8700	19.6403	0.6300	0.7000	0.7700	65.2452	(80)

Solar gains	65.2452	127.6335	210.1942	306.5557	375.6955	384.5912	366.1465	314.5144	244.4645	151.4479	81.3531	53.6545	(83)
Total gains	573.7983	647.3970	708.7608	787.6616	833.0893	822.9765	788.2323	737.7095	680.2252	604.8214	561.8424	552.0814	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4377	69.6734	69.9060	71.0196	71.2319	72.2371	72.2371	72.4264	71.8466	71.2319	70.8037	70.3616	
alpha	5.6292	5.6449	5.6604	5.7346	5.7488	5.8158	5.8158	5.8284	5.7898	5.7488	5.7202	5.6908	
util living area													
	0.9905	0.9803	0.9546	0.8704	0.7144	0.5154	0.3733	0.4153	0.6576	0.9094	0.9792	0.9921	(86)
MIT	20.0579	20.2343	20.4815	20.7790	20.9414	20.9925	20.9990	20.9983	20.9720	20.7510	20.3650	20.0363	(87)
Th 2	20.1053	20.1081	20.1108	20.1235	20.1259	20.1370	20.1370	20.1391	20.1328	20.1259	20.1211	20.1160	(88)
util rest of house													
	0.9877	0.9746	0.9419	0.8388	0.6603	0.4485	0.3005	0.3384	0.5850	0.8792	0.9722	0.9898	(89)
MIT 2	19.0197	19.2440	19.5523	19.9110	20.0800	20.1330	20.1367	20.1385	20.1153	19.8902	19.4206	19.0004	(90)
Living area fraction									fLA = Living area / (4) =			0.3673	(91)
MIT	19.4010	19.6077	19.8936	20.2298	20.3964	20.4487	20.4535	20.4543	20.4300	20.2064	19.7675	19.3809	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4010	19.6077	19.8936	20.2298	20.3964	20.4487	20.4535	20.4543	20.4300	20.2064	19.7675	19.3809	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9848	0.9707	0.9383	0.8430	0.6776	0.4729	0.3273	0.3667	0.6106	0.8823	0.9687	0.9873	(94)
Useful gains	565.0719	628.4464	664.9980	663.9898	564.5361	389.1845	257.9749	270.4864	415.3760	533.6500	544.2823	545.0695	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1052.7867	1021.9008	927.4985	772.2805	591.0091	391.9484	258.2387	270.9871	426.5069	652.8543	866.0945	1044.4615	(97)
Space heating kWh													
	362.8598	264.4014	195.3004	77.9693	19.6959	0.0000	0.0000	0.0000	0.0000	88.6880	231.7048	371.5477	(98a)
Space heating requirement - total per year (kWh/year)												1612.1673	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	362.8598	264.4014	195.3004	77.9693	19.6959	0.0000	0.0000	0.0000	0.0000	88.6880	231.7048	371.5477	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1612.1673	
Space heating per m2										(98c) / (4) =		22.5163	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	362.8598	264.4014	195.3004	77.9693	19.6959	0.0000	0.0000	0.0000	0.0000	88.6880	231.7048	371.5477	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	393.1309	286.4587	211.5931	84.4738	21.3390	0.0000	0.0000	0.0000	0.0000	96.0867	251.0344	402.5435	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	220.0265	194.5640	206.8867	182.6150	177.4450	160.3749	158.7450	164.8556	166.4254	184.9738	195.9008	217.7421	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1739	84.7482	83.9307	82.2956	80.6163	79.8000	79.8000	79.8000	79.8000	82.5101	84.4372	85.2475	(217)
Fuel for water heating, kWh/month													
	258.3261	229.5791	246.4971	221.9011	220.1105	200.9711	198.9285	206.5859	208.5532	224.1832	232.0077	255.4235	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2122	17.8195	16.0444	11.7549	9.0798	7.4183	8.2829	10.7664	13.9845	18.3484	20.7245	22.8296	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.1846	-28.4211	-42.9020	-50.7355	-56.9029	-53.9179	-53.2653	-49.2004	-42.4070	-33.5959	-21.5759	-16.4301	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.0246	-15.0946	-30.6024	-46.8558	-62.8363	-63.4584	-62.7068	-52.6825	-38.0819	-21.8704	-9.4691	-5.5310	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1746.6601	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2703.0671	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.2653	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-884.7523	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3830.2401	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1746.6601	0.2100	366.7986	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2703.0671	0.2100	567.6441	(264)
Space and water heating			934.4427	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.2653	0.1443	25.8735	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-468.5384	0.1336	-62.5766	
PV Unit electricity exported	-416.2139	0.1253	-52.1671	
Total			-114.7438	(269)
Total CO2, kg/year			857.5017	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1746.6601	1.1300	1973.7259	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2703.0671	1.1300	3054.4658	(278)
Space and water heating			5028.1917	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.2653	1.5338	274.9631	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-468.5384	1.4935	-699.7836	
PV Unit electricity exported	-416.2139	0.4600	-191.4782	
Total			-891.2618	(283)
Total Primary energy kWh/year			4541.9937	(286)
Target Primary Energy Rate (TPER)			63.4400	(287)

Full SAP Calculation Printout

Plot Reference	P-15	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-15
Plot Address	Flat 10, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	87 B	**DER**	3.49	**TER**	11.98
Environmental	97 A	**% DER < TER**			70.87
CO_2 Emissions (t/year)	0.2	**DFEE**	27.78	**TFEE**	29.77
Compliance Check	See BREL	**% DFEE < TFEE**			6.68
% DPER < TPER	42.75	**DPER**	36.32	**TPER**	63.44

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.6000 (1b)	x	2.5500 (2b)	=	182.5800	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.5800	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.1800	(17)
Infiltration rate		0.1090	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0927	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1181	0.1158	0.1135	0.1019	0.0996	0.0880	0.0880	0.0857	0.0927	0.0996	0.1042	0.1089	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2541	0.2518	0.2495	0.2379	0.2356	0.2240	0.2240	0.2217	0.2287	0.2356	0.2402	0.2449	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	33.3700	10.8700	22.5000	0.2100	4.7250	110.0000	2474.9999	(29a)
Communal Wall	22.0600	2.1500	19.9100	0.2200	4.3802	110.0000	2190.0999	(29a)
Lift Shaft Wall	11.3000		11.3000	0.2100	2.3730	110.0000	1243.0000	(29a)
Total net area of external elements Aum(A, m2)			66.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5048			(33)
Main dwelling								
Party Wall 1			43.4300	0.0000	0.0000	110.0000	4777.3000	(32)
Party Floor 1			71.5500			40.0000	2862.0000	(32d)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			192.6100			9.0000	1733.4900	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17427.3899	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 243.3993 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	38.3900	0.0380	1.4588
E18	Party wall between dwellings	11.7000	0.0380	0.4446
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	27.3200	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2	Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4	Jamb	18.6000	0.0160	0.2976
E20	Exposed floor (normal)	0.0000	0.1200	0.0000
E16	Corner (normal)	8.5500	0.0540	0.4617
E17	Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5	Ground floor (normal)	24.5000	0.1120	2.7440
E25	Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3508 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 32.8556 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3116	15.1721	15.0325	14.3347	14.1952	13.4974	13.4974	13.3578	13.7765	14.1952	14.4743	14.7534	(38)
Heat transfer coeff	48.1672	48.0276	47.8881	47.1903	47.0507	46.3530	46.3530	46.2134	46.6321	47.0507	47.3299	47.6090	(39)

Average = Sum(39)m / 12 = 47.1554

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6727	0.6708	0.6688	0.6591	0.6571	0.6474	0.6474	0.6454	0.6513	0.6571	0.6610	0.6649	(40)
HLP (average)												0.6586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2843 (42)

Hot water usage for mixer showers

62.5204	61.5809	60.2117	57.5922	55.6590	53.5031	52.2777	53.6365	55.1260	57.4407	60.1165	62.2809	(42a)

Hot water usage for baths

27.0091	26.6079	26.0431	25.0016	24.2217	23.3569	22.8898	23.4508	24.0615	24.9868	26.0498	26.9177	(42b)

Hot water usage for other uses

38.0239	36.6412	35.2585	33.8758	32.4931	31.1104	31.1104	32.4931	33.8758	35.2585	36.6412	38.0239	(42c)

Average daily hot water use (litres/day) 117.2505 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5533	124.8300	121.5133	116.4695	112.3738	107.9705	106.2780	109.5804	113.0632	117.6860	122.8075	127.2225	(44)
Energy conte	202.0133	177.7562	186.7614	159.4410	151.2767	132.7623	128.5340	135.6834	139.4183	159.6988	174.9618	199.1997	(45)

Energy content (annual) Total = Sum(45)m = 1947.5069

Distribution loss (46)m = 0.15 x (45)m

30.3020	26.6634	28.0142	23.9161	22.6915	19.9143	19.2801	20.3525	20.9127	23.9548	26.2443	29.8800	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)

Total per year (kWh/year) = Sum(64)m = 2292.4319 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

67.1694	59.1039	62.0982	53.0141	50.2995	44.1435	42.7376	45.1147	46.3566	53.0998	58.1748	66.2339	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.8582	22.0788	17.9557	13.5936	10.1614	8.5787	9.2696	12.0489	16.1720	20.5341	23.9663	25.5490	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	300.0032	303.1163	295.2714	278.5706	257.4887	237.6748	224.4378	221.3247	229.1696	245.8705	266.9523	286.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)	90.2815	87.9523	83.4653	73.6307	67.6069	61.3104	57.4430	60.6381	64.3841	71.3708	80.7983	89.0240	(72)
Total internal gains	511.8199	509.8244	493.3694	462.4719	431.9340	404.2408	387.8274	390.6887	406.4028	434.4524	468.3940	498.0164	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
West	5.4500	19.6403	0.3300	0.0000	0.7700	27.1987	(80)

Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107	(83)
Total gains	566.0676	615.9445	668.1340	717.3557	744.3036	724.0067	692.2576	652.1898	609.6613	560.3728	536.0345	542.6271	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	100.5029	100.7949	101.0887	102.5834	102.8877	104.4365	104.4365	104.7519	103.8114	102.8877	102.2809	101.6813	
alpha	7.7002	7.7197	7.7392	7.8389	7.8592	7.9624	7.9624	7.9835	7.9208	7.8592	7.8187	7.7788	
util living area	0.9792	0.9592	0.9019	0.7647	0.5841	0.4095	0.2946	0.3259	0.5262	0.8187	0.9553	0.9837	(86)
MIT	20.5803	20.6938	20.8458	20.9622	20.9953	20.9998	21.0000	21.0000	20.9984	20.9485	20.7548	20.5529	(87)
Th 2	20.3650	20.3667	20.3684	20.3771	20.3789	20.3875	20.3875	20.3893	20.3841	20.3789	20.3754	20.3719	(88)
util rest of house	0.9741	0.9500	0.8829	0.7327	0.5464	0.3704	0.2536	0.2827	0.4799	0.7833	0.9437	0.9796	(89)
MIT 2	19.8861	20.0271	20.2085	20.3426	20.3753	20.3874	20.3875	20.3893	20.3831	20.3331	20.1111	19.8579	(90)
Living area fraction									fLA = Living area / (4) =			0.3673	(91)
MIT	20.1411	20.2720	20.4426	20.5702	20.6030	20.6123	20.6125	20.6136	20.6091	20.5592	20.3475	20.1132	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1411	20.2720	20.4426	20.5702	20.6030	20.6123	20.6125	20.6136	20.6091	20.5592	20.3475	20.1132	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9485	0.8853	0.7429	0.5601	0.3848	0.2687	0.2986	0.4969	0.7940	0.9431	0.9776	(94)
Useful gains	550.2252	584.1980	591.4821	532.8881	416.8825	278.6037	185.9873	194.7154	302.9226	444.9179	505.5520	530.4984	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	763.0223	738.2791	667.6834	550.7192	418.8937	278.6894	185.9911	194.7242	303.5319	468.5860	627.0024	757.6089	(97)
Space heating kWh	158.3210	103.5424	56.6938	12.8383	1.4963	0.0000	0.0000	0.0000	0.0000	17.6090	87.4443	168.9702	(98a)
Space heating requirement - total per year (kWh/year)												606.9154	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	158.3210	103.5424	56.6938	12.8383	1.4963	0.0000	0.0000	0.0000	0.0000	17.6090	87.4443	168.9702	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												606.9154	
Space heating per m2											(98c) / (4) =	8.4765	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	158.3210	103.5424	56.6938	12.8383	1.4963	0.0000	0.0000	0.0000	0.0000	17.6090	87.4443	168.9702	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	158.3210	103.5424	56.6938	12.8383	1.4963	0.0000	0.0000	0.0000	0.0000	17.6090	87.4443	168.9702	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	63.9565	56.4656	59.7394	51.9240	49.9279	44.5474	43.6396	45.6164	46.3878	52.2566	56.2155	63.1785	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.1145	10.0389	11.1145	10.7560	11.1145	10.7560	11.1145	11.1145	10.7560	11.1145	10.7560	11.1145	(231)
Lighting	21.7582	17.4552	15.7165	11.5146	8.8942	7.2666	8.1136	10.5463	13.6987	17.9734	20.3009	22.3629	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												606.9154	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	633.8551	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	130.8642	(230a)
Total electricity for the above, kWh/year	130.8642	(231)
Electricity for lighting (calculated in Appendix L)	175.6012	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1547.2359	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	606.9154	16.4900	100.0804	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.8551	16.4900	104.5227	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	130.8642	16.4900	21.5795	(249)
Energy for lighting	175.6012	16.4900	28.9566	(250)
Additional standing charges			0.0000	(251)
Total energy cost			255.1392	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7877	(257)
SAP value		87.2308	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	606.9154	0.1585	96.2217	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.8551	0.1411	89.4667	(264)
Space and water heating			185.6884	(265)
Pumps, fans and electric keep-hot	130.8642	0.1387	18.1525	(267)
Energy for lighting	175.6012	0.1443	25.3447	(268)
Total CO2, kg/year			229.1856	(272)
CO2 emissions per m2			3.2000	(273)
EI value			97.3661	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.6000	(1b) x	2.5500	(2b) =	182.5800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		182.5800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	2.1800	(17)
Infiltration rate	0.1090	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.0927	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.0996	0.0950	0.0950	0.0880	0.0903	0.0788	0.0788	0.0764	0.0788	0.0880	0.0857	0.0927	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2356	0.2310	0.2310	0.2240	0.2263	0.2148	0.2148	0.2124	0.2148	0.2240	0.2217	0.2287	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	33.3700	10.8700	22.5000	0.2100	4.7250	110.0000	2474.9999	(29a)
Communal Wall	22.0600	2.1500	19.9100	0.2200	4.3802	110.0000	2190.0999	(29a)
Lift Shaft Wall	11.3000		11.3000	0.2100	2.3730	110.0000	1243.0000	(29a)
Total net area of external elements Aum(A, m2)			66.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5048			(33)
Main dwelling								
Party Wall 1			43.4300	0.0000	0.0000	110.0000	4777.3000	(32)
Party Floor 1			71.5500			40.0000	2862.0000	(32d)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			192.6100			9.0000	1733.4900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	17427.3899	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	243.3993	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.3900	0.0380	1.4588
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0160	0.2976
E20 Exposed floor (normal)	0.0000	0.1200	0.0000
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3508	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	32.8556	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.1952	13.9160	13.9160	13.4974	13.6369	12.9391	12.9391	12.7996	12.9391	13.4974	13.3578	13.7765	(38)
Heat transfer coeff	47.0507	46.7716	46.7716	46.3530	46.4925	45.7947	45.7947	45.6552	45.7947	46.3530	46.2134	46.6321	(39)
Average = Sum(39)m / 12 =												46.3064	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6571	0.6532	0.6532	0.6474	0.6493	0.6396	0.6396	0.6376	0.6396	0.6474	0.6454	0.6513	(40)
HLP (average)												0.6467	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2843	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.5204	61.5809	60.2117	57.5922	55.6590	53.5031	52.2777	53.6365	55.1260	57.4407	60.1165	62.2809	(42a)

Hot water usage for baths

27.0091	26.6079	26.0431	25.0016	24.2217	23.3569	22.8898	23.4508	24.0615	24.9868	26.0498	26.9177	(42b)

Hot water usage for other uses

38.0239	36.6412	35.2585	33.8758	32.4931	31.1104	31.1104	32.4931	33.8758	35.2585	36.6412	38.0239	(42c)

Average daily hot water use (litres/day)	117.2505	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5533	124.8300	121.5133	116.4695	112.3738	107.9705	106.2780	109.5804	113.0632	117.6860	122.8075	127.2225	(44)
Energy conte	202.0133	177.7562	186.7614	159.4410	151.2767	132.7623	128.5340	135.6834	139.4183	159.6988	174.9618	199.1997	(45)
Energy content (annual)											Total = Sum(45)m =	1947.5069	

Distribution loss (46)m = 0.15 x (45)m

30.3020	26.6634	28.0142	23.9161	22.6915	19.9143	19.2801	20.3525	20.9127	23.9548	26.2443	29.8800	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)
											Total per year (kWh/year) = Sum(64)m =	2292.4319	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	67.1694	59.1039	62.0982	53.0141	50.2995	44.1435	42.7376	45.1147	46.3566	53.0998	58.1748	66.2339	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.8582	22.0788	17.9557	13.5936	10.1614	8.5787	9.2696	12.0489	16.1720	20.5341	23.9663	25.5490	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	300.0032	303.1163	295.2714	278.5706	257.4887	237.6748	224.4378	221.3247	229.1696	245.8705	266.9523	286.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)													
	90.2815	87.9523	83.4653	73.6307	67.6069	61.3104	57.4430	60.6381	64.3841	71.3708	80.7983	89.0240	(72)
Total internal gains													
	511.8199	509.8244	493.3694	462.4719	431.9340	404.2408	387.8274	390.6887	406.4028	434.4524	468.3940	498.0164	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
West	5.4500	23.8018	0.3300	0.0000	0.7700	32.9618	(80)

Solar gains	65.7421	112.3310	183.3208	270.7289	322.6701	349.1703	329.2342	290.3536	227.0476	142.9844	80.7485	54.3745	(83)
Total gains	577.5620	622.1554	676.6902	733.2008	754.6041	753.4111	717.0616	681.0423	633.4504	577.4368	549.1425	552.3909	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	102.8877	103.5017	103.5017	104.4365	104.1230	105.7096	105.7096	106.0327	105.7096	104.4365	104.7519	103.8114	
alpha	7.8592	7.9001	7.9001	7.9624	7.9415	8.0473	8.0473	8.0688	8.0473	7.9624	7.9835	7.9208	
util living area													
	0.9668	0.9393	0.8583	0.6887	0.4981	0.3161	0.2108	0.2279	0.4335	0.7397	0.9243	0.9733	(86)
MIT	20.6806	20.7789	20.9069	20.9839	20.9987	21.0000	21.0000	21.0000	20.9997	20.9777	20.8427	20.6565	(87)
Th 2	20.3789	20.3823	20.3823	20.3875	20.3858	20.3945	20.3945	20.3962	20.3945	20.3875	20.3893	20.3841	(88)
util rest of house													
	0.9589	0.9263	0.8340	0.6543	0.4607	0.2793	0.1721	0.1875	0.3899	0.6988	0.9063	0.9667	(89)
MIT 2	20.0223	20.1436	20.2898	20.3737	20.3849	20.3945	20.3945	20.3962	20.3943	20.3693	20.2272	19.9975	(90)
Living area fraction										fLA = Living area / (4) =		0.3673	(91)
MIT	20.2641	20.3770	20.5164	20.5979	20.6104	20.6169	20.6169	20.6180	20.6167	20.5927	20.4533	20.2396	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2641	20.3770	20.5164	20.5979	20.6104	20.6169	20.6169	20.6180	20.6167	20.5927	20.4533	20.2396	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9572	0.9262	0.8396	0.6663	0.4744	0.2928	0.1863	0.2023	0.4059	0.7128	0.9084	0.9649	(94)
Useful gains	552.8643	576.2198	568.1207	488.5269	357.9648	220.5804	133.5789	137.7875	257.1065	411.6082	498.8184	533.0050	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	713.4828	686.4660	613.4771	495.8777	358.4753	220.5883	133.5791	137.7878	257.2147	421.4758	575.5084	705.9887	(97)
Space heating kWh													
	119.5002	74.0855	33.7451	5.2926	0.3798	0.0000	0.0000	0.0000	0.0000	7.3415	55.2168	128.6999	(98a)
Space heating requirement - total per year (kWh/year)												424.2613	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	119.5002	74.0855	33.7451	5.2926	0.3798	0.0000	0.0000	0.0000	0.0000	7.3415	55.2168	128.6999	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												424.2613	
Space heating per m2											(98c) / (4) =	5.9254	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	119.5002	74.0855	33.7451	5.2926	0.3798	0.0000	0.0000	0.0000	0.0000	7.3415	55.2168	128.6999	(98)

Space heating efficiency (main heating system 1)

100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)

119.5002	74.0855	33.7451	5.2926	0.3798	0.0000	0.0000	0.0000	0.0000	7.3415	55.2168	128.6999	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)

Efficiency of water heater 361.6650 (216)

(217)m 361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)

Fuel for water heating, kWh/month

63.9565	56.4656	59.7394	51.9240	49.9279	44.5474	43.6396	45.6164	46.3878	52.2566	56.2155	63.1785	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 11.1145	10.0389	11.1145	10.7560	11.1145	10.7560	11.1145	11.1145	10.7560	11.1145	10.7560	11.1145	(231)
Lighting 21.7582	17.4552	15.7165	11.5146	8.8942	7.2666	8.1136	10.5463	13.6987	17.9734	20.3009	22.3629	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 424.2613 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 633.8551 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 130.8642 (230a)
Total electricity for the above, kWh/year 130.8642 (231)
Electricity for lighting (calculated in Appendix L) 175.6012 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1364.5818 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	424.2613	27.6700	117.3931	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.8551	27.6700	175.3877	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	130.8642	27.6700	36.2101	(249)
Energy for lighting	175.6012	27.6700	48.5888	(250)
Additional standing charges			0.0000	(251)
Total energy cost			377.5798	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	424.2613	0.1594	67.6164	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.8551	0.1411	89.4667	(264)
Space and water heating			157.0831	(265)
Pumps, fans and electric keep-hot	130.8642	0.1387	18.1525	(267)
Energy for lighting	175.6012	0.1443	25.3447	(268)
Total CO2, kg/year			200.5803	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	424.2613	1.5899	674.5362	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.8551	1.5219	964.6782	(278)
Space and water heating			1639.2144	(279)
Pumps, fans and electric keep-hot	130.8642	1.5128	197.9714	(281)
Energy for lighting	175.6012	1.5338	269.3430	(282)
Total Primary energy kWh/year			2106.5288	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 97

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	B 87
Potential environmental impact rating:	A 97

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£378	£378	£0
Space heating	£154	£154	£0
Water heating	£175	£175	£0
Lighting	£49	£49	£0
Total cost of fuels	£378	£378	£0
Total cost of uses	£378	£378	£0
Delivered energy	19 kWh/m²	19 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	29 kWh/m²	29 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.6000 (1b)	x	2.5500 (2b)	=	182.5800	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.5800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.1800	(17)
Infiltration rate		0.1090	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0927	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1181	0.1158	0.1135	0.1019	0.0996	0.0880	0.0880	0.0857	0.0927	0.0996	0.1042	0.1089	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2541	0.2518	0.2495	0.2379	0.2356	0.2240	0.2240	0.2217	0.2287	0.2356	0.2402	0.2449 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	33.3700	10.8700	22.5000	0.2100	4.7250	110.0000	2474.9999	(29a)
Communal Wall	22.0600	2.1500	19.9100	0.2200	4.3802	110.0000	2190.0999	(29a)
Lift Shaft Wall	11.3000		11.3000	0.2100	2.3730	110.0000	1243.0000	(29a)
Total net area of external elements Aum(A, m2)			66.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5048			(33)
Main dwelling								
Party Wall 1			43.4300	0.0000	0.0000	110.0000	4777.3000	(32)
Party Floor 1			71.5500			40.0000	2862.0000	(32d)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			192.6100			9.0000	1733.4900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17427.3899 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 243.3993 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.3900	0.0380	1.4588
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0160	0.2976
E20 Exposed floor (normal)	0.0000	0.1200	0.0000
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3508 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.8556 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.3116	15.1721	15.0325	14.3347	14.1952	13.4974	13.4974	13.3578	13.7765	14.1952	14.4743	14.7534	(38)
Heat transfer coeff	48.1672	48.0276	47.8881	47.1903	47.0507	46.3530	46.3530	46.2134	46.6321	47.0507	47.3299	47.6090	(39)
Average = Sum(39)m / 12 =												47.1554	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6727	0.6708	0.6688	0.6591	0.6571	0.6474	0.6474	0.6454	0.6513	0.6571	0.6610	0.6649	(40)
HLP (average)												0.6586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2843 (42)
Hot water usage for mixer showers

62.5204	61.5809	60.2117	57.5922	55.6590	53.5031	52.2777	53.6365	55.1260	57.4407	60.1165	62.2809	(42a)

Hot water usage for baths

27.0091	26.6079	26.0431	25.0016	24.2217	23.3569	22.8898	23.4508	24.0615	24.9868	26.0498	26.9177	(42b)

Hot water usage for other uses

38.0239	36.6412	35.2585	33.8758	32.4931	31.1104	31.1104	32.4931	33.8758	35.2585	36.6412	38.0239	(42c)

Average daily hot water use (litres/day) 117.2505 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5533	124.8300	121.5133	116.4695	112.3738	107.9705	106.2780	109.5804	113.0632	117.6860	122.8075	127.2225	(44)
Energy conte	202.0133	177.7562	186.7614	159.4410	151.2767	132.7623	128.5340	135.6834	139.4183	159.6988	174.9618	199.1997	(45)
Energy content (annual)											Total = Sum(45)m =	1947.5069	

Distribution loss (46)m = 0.15 x (45)m

30.3020	26.6634	28.0142	23.9161	22.6915	19.9143	19.2801	20.3525	20.9127	23.9548	26.2443	29.8800	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)
									Total per year (kWh/year) = Sum(64)m =		2292.4319	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

67.1694	59.1039	62.0982	53.0141	50.2995	44.1435	42.7376	45.1147	46.3566	53.0998	58.1748	66.2339	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.8582	22.0788	17.9557	13.5936	10.1614	8.5787	9.2696	12.0489	16.1720	20.5341	23.9663	25.5490	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	300.0032	303.1163	295.2714	278.5706	257.4887	237.6748	224.4378	221.3247	229.1696	245.8705	266.9523	286.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)													
	90.2815	87.9523	83.4653	73.6307	67.6069	61.3104	57.4430	60.6381	64.3841	71.3708	80.7983	89.0240	(72)
Total internal gains													
	511.8199	509.8244	493.3694	462.4719	431.9340	404.2408	387.8274	390.6887	406.4028	434.4524	468.3940	498.0164	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
West	5.4500	19.6403	0.3300	0.0000	0.7700	27.1987	(80)

Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107	(83)
Total gains	566.0676	615.9445	668.1340	717.3557	744.3036	724.0067	692.2576	652.1898	609.6613	560.3728	536.0345	542.6271	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	100.5029	100.7949	101.0887	102.5834	102.8877	104.4365	104.4365	104.7519	103.8114	102.8877	102.2809	101.6813	
alpha	7.7002	7.7197	7.7392	7.8389	7.8592	7.9624	7.9624	7.9835	7.9208	7.8592	7.8187	7.7788	
util living area													
	0.9792	0.9592	0.9019	0.7647	0.5841	0.4095	0.2946	0.3259	0.5262	0.8187	0.9553	0.9837	(86)
MIT	20.5803	20.6938	20.8458	20.9622	20.9953	20.9998	21.0000	21.0000	20.9984	20.9485	20.7548	20.5529	(87)
Th 2	20.3650	20.3667	20.3684	20.3771	20.3789	20.3875	20.3875	20.3893	20.3841	20.3789	20.3754	20.3719	(88)
util rest of house													
	0.9741	0.9500	0.8829	0.7327	0.5464	0.3704	0.2536	0.2827	0.4799	0.7833	0.9437	0.9796	(89)
MIT 2	19.8861	20.0271	20.2085	20.3426	20.3753	20.3874	20.3875	20.3893	20.3831	20.3331	20.1111	19.8579	(90)
Living area fraction									fLA = Living area / (4) =			0.3673	(91)
MIT	20.1411	20.2720	20.4426	20.5702	20.6030	20.6123	20.6125	20.6136	20.6091	20.5592	20.3475	20.1132	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1411	20.2720	20.4426	20.5702	20.6030	20.6123	20.6125	20.6136	20.6091	20.5592	20.3475	20.1132	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9485	0.8853	0.7429	0.5601	0.3848	0.2687	0.2986	0.4969	0.7940	0.9431	0.9776	(94)
Useful gains	550.2252	584.1980	591.4821	532.8881	416.8825	278.6037	185.9873	194.7154	302.9226	444.9179	505.5520	530.4984	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	763.0223	738.2791	667.6834	550.7192	418.8937	278.6894	185.9911	194.7242	303.5319	468.5860	627.0024	757.6089	(97)
Space heating kWh													
	158.3210	103.5424	56.6938	12.8383	1.4963	0.0000	0.0000	0.0000	0.0000	17.6090	87.4443	168.9702	(98a)
Space heating requirement - total per year (kWh/year)												606.9154	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	158.3210	103.5424	56.6938	12.8383	1.4963	0.0000	0.0000	0.0000	0.0000	17.6090	87.4443	168.9702	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												606.9154	
Space heating per m2											(98c) / (4) =	8.4765	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	158.3210	103.5424	56.6938	12.8383	1.4963	0.0000	0.0000	0.0000	0.0000	17.6090	87.4443	168.9702	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	158.3210	103.5424	56.6938	12.8383	1.4963	0.0000	0.0000	0.0000	0.0000	17.6090	87.4443	168.9702	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)

Fuel for water heating, kWh/month

	63.9565	56.4656	59.7394	51.9240	49.9279	44.5474	43.6396	45.6164	46.3878	52.2566	56.2155	63.1785 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	11.1145	10.0389	11.1145	10.7560	11.1145	10.7560	11.1145	11.1145	10.7560	11.1145	10.7560	11.1145 (231)
Lighting	21.7582	17.4552	15.7165	11.5146	8.8942	7.2666	8.1136	10.5463	13.6987	17.9734	20.3009	22.3629 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	606.9154	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	633.8551	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	130.8642	(230a)
Total electricity for the above, kWh/year	130.8642	(231)
Electricity for lighting (calculated in Appendix L)	175.6012	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1547.2359	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	606.9154	16.4900	100.0804	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.8551	16.4900	104.5227	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	130.8642	16.4900	21.5795	(249)
Energy for lighting	175.6012	16.4900	28.9566	(250)
Additional standing charges			0.0000	(251)
Total energy cost			255.1392	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7877	(257)
SAP value		87.2308	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	606.9154	0.1585	96.2217	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.8551	0.1411	89.4667	(264)
Space and water heating			185.6884	(265)
Pumps, fans and electric keep-hot	130.8642	0.1387	18.1525	(267)
Energy for lighting	175.6012	0.1443	25.3447	(268)
Total CO2, kg/year			229.1856	(272)
CO2 emissions per m2			3.2000	(273)
EI value			97.3661	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.6000 (1b)	x	2.5500 (2b)	=	182.5800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.5800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.1800 (17)
Infiltration rate		0.1090 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0927 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.0996	0.0950	0.0950	0.0880	0.0903	0.0788	0.0788	0.0764	0.0788	0.0880	0.0857	0.0927	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2356	0.2310	0.2310	0.2240	0.2263	0.2148	0.2148	0.2124	0.2148	0.2240	0.2217	0.2287	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	33.3700	10.8700	22.5000	0.2100	4.7250	110.0000	2474.9999	(29a)
Communal Wall	22.0600	2.1500	19.9100	0.2200	4.3802	110.0000	2190.0999	(29a)
Lift Shaft Wall	11.3000		11.3000	0.2100	2.3730	110.0000	1243.0000	(29a)
Total net area of external elements Aum(A, m2)			66.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5048			(33)
Main dwelling								
Party Wall 1			43.4300	0.0000	0.0000	110.0000	4777.3000	(32)
Party Floor 1			71.5500			40.0000	2862.0000	(32d)
Party Ceiling 1			71.5500			30.0000	2146.5000	(32b)
Internal Wall 1			192.6100			9.0000	1733.4900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17427.3899 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		243.3993 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.3900	0.0380	1.4588
E18 Party wall between dwellings	11.7000	0.0380	0.4446
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5900	0.3300	0.8547
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.6000	0.0160	0.2976
E20 Exposed floor (normal)	0.0000	0.1200	0.0000
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.3508 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.8556 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.1952	13.9160	13.9160	13.4974	13.6369	12.9391	12.9391	12.7996	12.9391	13.4974	13.3578	13.7765	(38)
Heat transfer coeff	47.0507	46.7716	46.7716	46.3530	46.4925	45.7947	45.7947	45.6552	45.7947	46.3530	46.2134	46.6321	(39)
Average = Sum(39)m / 12 =												46.3064	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6571	0.6532	0.6532	0.6474	0.6493	0.6396	0.6396	0.6376	0.6396	0.6474	0.6454	0.6513	(40)
HLP (average)												0.6467	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2843 (42)
Hot water usage for mixer showers		
	62.5204 61.5809 60.2117 57.5922 55.6590 53.5031 52.2777 53.6365 55.1260 57.4407 60.1165 62.2809	(42a)
Hot water usage for baths		
	27.0091 26.6079 26.0431 25.0016 24.2217 23.3569 22.8898 23.4508 24.0615 24.9868 26.0498 26.9177	(42b)

Hot water usage for other uses

	38.0239	36.6412	35.2585	33.8758	32.4931	31.1104	31.1104	32.4931	33.8758	35.2585	36.6412	38.0239 (42c)

Average daily hot water use (litres/day) 117.2505 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.5533	124.8300	121.5133	116.4695	112.3738	107.9705	106.2780	109.5804	113.0632	117.6860	122.8075	127.2225	(44)
Energy conte	202.0133	177.7562	186.7614	159.4410	151.2767	132.7623	128.5340	135.6834	139.4183	159.6988	174.9618	199.1997	(45)
Energy content (annual)										Total = Sum(45)m =		1947.5069	
Distribution loss (46)m = 0.15 x (45)m	30.3020	26.6634	28.0142	23.9161	22.6915	19.9143	19.2801	20.3525	20.9127	23.9548	26.2443	29.8800	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)
										Total per year (kWh/year) = Sum(64)m =		2292.4319	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	67.1694	59.1039	62.0982	53.0141	50.2995	44.1435	42.7376	45.1147	46.3566	53.0998	58.1748	66.2339	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	137.0600	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.8582	22.0788	17.9557	13.5936	10.1614	8.5787	9.2696	12.0489	16.1720	20.5341	23.9663	25.5490	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	300.0032	303.1163	295.2714	278.5706	257.4887	237.6748	224.4378	221.3247	229.1696	245.8705	266.9523	286.7663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	50.9903	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)													
	90.2815	87.9523	83.4653	73.6307	67.6069	61.3104	57.4430	60.6381	64.3841	71.3708	80.7983	89.0240	(72)
Total internal gains													
	511.8199	509.8244	493.3694	462.4719	431.9340	404.2408	387.8274	390.6887	406.4028	434.4524	468.3940	498.0164	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
West	5.4500	23.8018	0.3300	0.0000	0.7700	32.9618	(80)

Solar gains	65.7421	112.3310	183.3208	270.7289	322.6701	349.1703	329.2342	290.3536	227.0476	142.9844	80.7485	54.3745	(83)
Total gains	577.5620	622.1554	676.6902	733.2008	754.6041	753.4111	717.0616	681.0423	633.4504	577.4368	549.1425	552.3909	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	102.8877	103.5017	103.5017	104.4365	104.1230	105.7096	105.7096	106.0327	105.7096	104.4365	104.7519	103.8114	
alpha	7.8592	7.9001	7.9001	7.9624	7.9415	8.0473	8.0473	8.0688	8.0473	7.9624	7.9835	7.9208	
util living area	0.9668	0.9393	0.8583	0.6887	0.4981	0.3161	0.2108	0.2279	0.4335	0.7397	0.9243	0.9733	(86)
MIT	20.6806	20.7789	20.9069	20.9839	20.9987	21.0000	21.0000	21.0000	20.9997	20.9777	20.8427	20.6565	(87)
Th 2	20.3789	20.3823	20.3823	20.3875	20.3858	20.3945	20.3945	20.3962	20.3945	20.3875	20.3893	20.3841	(88)
util rest of house	0.9589	0.9263	0.8340	0.6543	0.4607	0.2793	0.1721	0.1875	0.3899	0.6988	0.9063	0.9667	(89)
MIT 2	20.0223	20.1436	20.2898	20.3737	20.3849	20.3945	20.3945	20.3962	20.3943	20.3693	20.2272	19.9975	(90)
Living area fraction										fLA = Living area / (4) =		0.3673	(91)
MIT	20.2641	20.3770	20.5164	20.5979	20.6104	20.6169	20.6169	20.6180	20.6167	20.5927	20.4533	20.2396	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2641	20.3770	20.5164	20.5979	20.6104	20.6169	20.6169	20.6180	20.6167	20.5927	20.4533	20.2396	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9572	0.9262	0.8396	0.6663	0.4744	0.2928	0.1863	0.2023	0.4059	0.7128	0.9084	0.9649	(94)
Useful gains	552.8643	576.2198	568.1207	488.5269	357.9648	220.5804	133.5789	137.7875	257.1065	411.6082	498.8184	533.0050	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	713.4828	686.4660	613.4771	495.8777	358.4753	220.5883	133.5791	137.7878	257.2147	421.4758	575.5084	705.9887	(97)
Space heating kWh													

119.5002	74.0855	33.7451	5.2926	0.3798	0.0000	0.0000	0.0000	0.0000	7.3415	55.2168	128.6999 (98a)
Space heating requirement - total per year (kWh/year)											424.2613
Solar heating kWh											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)											0.0000
Space heating kWh											
119.5002	74.0855	33.7451	5.2926	0.3798	0.0000	0.0000	0.0000	0.0000	7.3415	55.2168	128.6999 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)											424.2613
Space heating per m2										(98c) / (4) =	5.9254 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	119.5002	74.0855	33.7451	5.2926	0.3798	0.0000	0.0000	0.0000	0.0000	7.3415	55.2168	128.6999	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	119.5002	74.0855	33.7451	5.2926	0.3798	0.0000	0.0000	0.0000	0.0000	7.3415	55.2168	128.6999	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	231.3083	204.2162	216.0564	187.7910	180.5717	161.1123	157.8290	164.9784	167.7683	188.9938	203.3118	228.4947	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	63.9565	56.4656	59.7394	51.9240	49.9279	44.5474	43.6396	45.6164	46.3878	52.2566	56.2155	63.1785	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.1145	10.0389	11.1145	10.7560	11.1145	10.7560	11.1145	11.1145	10.7560	11.1145	10.7560	11.1145	(231)
Lighting	21.7582	17.4552	15.7165	11.5146	8.8942	7.2666	8.1136	10.5463	13.6987	17.9734	20.3009	22.3629	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	424.2613 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	361.6650
Water heating fuel used	633.8551 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)	
mechanical ventilation fans (SFP = 0.5875)	130.8642 (230a)
Total electricity for the above, kWh/year	130.8642 (231)
Electricity for lighting (calculated in Appendix L)	175.6012 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1364.5818 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	424.2613	27.6700	117.3931	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.8551	27.6700	175.3877	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	130.8642	27.6700	36.2101	(249)
Energy for lighting	175.6012	27.6700	48.5888	(250)
Additional standing charges			0.0000	(251)
Total energy cost			377.5798	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	424.2613	0.1594	67.6164	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	633.8551	0.1411	89.4667	(264)
Space and water heating			157.0831	(265)
Pumps, fans and electric keep-hot	130.8642	0.1387	18.1525	(267)
Energy for lighting	175.6012	0.1443	25.3447	(268)
Total CO2, kg/year			200.5803	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	424.2613	1.5899	674.5362	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	633.8551	1.5219	964.6782	(278)
Space and water heating			1639.2144	(279)
Pumps, fans and electric keep-hot	130.8642	1.5128	197.9714	(281)
Energy for lighting	175.6012	1.5338	269.3430	(282)
Total Primary energy kWh/year			2106.5288	(286)

Summary for Input Data

Plot Reference	P-16	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-16
Plot Address	Flat 7, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.32	**TER**	11.79
Environmental	96 A	**% DER < TER**			63.36
CO_2 Emissions (t/year)	0.31	**DFEE**	33.25	**TFEE**	34.50
Compliance Check	See BREL	**% DFEE < TFEE**			3.62
% DPER < TPER	28.34	**DPER**	44.57	**TPER**	62.20

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	241.93	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	31.68 m	91.22 m²	2.55 m

8.0 Living Area 34.35 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	66.37	46.25	0.00	None	20.12	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	5.27	3.21	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	19.72	19.72	0.60	Stairwell Access Corridor 2	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	32.13	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	200.33

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	91.22

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	91.22

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	North	2.06	
Patio Door	Patio Door	Brickwork	North	6.50	
West	Window	Brickwork	West	8.17	
North	Window	Brickwork	North	5.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	59.47	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	5.76	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	22.32	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	3.89	0.33	0.33	Abbey Calculated	No
E2 Other lintels (including other steel lintels)	Independently assessed	9.39	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	32.89	0.02	0.02	RCD	No
E16 Corner (normal)	Gov Approved Scheme	11.52	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.76	-0.10	-0.10	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.88	0.03	0.03	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value	0.08	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0

Summary for Input Data

Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.91	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	9
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Summary for Input Data

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-16	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-16
Plot Address	Flat 7, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.32	**TER**	11.79
Environmental	96 A	**% DER < TER**			63.36
CO_2 Emissions (t/year)	0.31	**DFEE**	33.25	**TFEE**	34.50
Compliance Check	See BREL	**% DFEE < TFEE**			3.62
% DPER < TPER	28.34	**DPER**	44.57	**TPER**	62.20

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	232.6110	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9100	(17)
Infiltration rate		0.1455	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1237	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1577	0.1546	0.1515	0.1360	0.1330	0.1175	0.1175	0.1144	0.1237	0.1330	0.1391	0.1453	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

Effective ac	0.2937	0.2906	0.2875	0.2720	0.2690	0.2535	0.2535	0.2504	0.2597	0.2690	0.2751	0.2813	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Brickwork	66.3700	20.1200	46.2500	0.2100	9.7125	110.0000	5087.5003	(29a)
Communal Wall	5.2700	2.0600	3.2100	0.2200	0.7062	110.0000	353.1000	(29a)
Stairwell Wall	19.7200		19.7200	0.2200	4.3384	110.0000	2169.1999	(29a)
Total net area of external elements Aum(A, m2)			91.3600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2673			(33)
Main dwelling								
Party Wall 1			32.1300	0.0000	0.0000	110.0000	3534.3001	(32)
Party Floor 1			91.2200			70.0000	6385.4000	(32d)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			200.3300			9.0000	1802.9700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22069.0704 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 241.9324 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.4700	0.0380	2.2599
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8900	0.3300	1.2837
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.8900	0.0160	0.5262
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6548 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.9221 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.5438	22.3064	22.0691	20.8824	20.6451	19.4584	19.4584	19.2211	19.9331	20.6451	21.1198	21.5944	(38)
Heat transfer coeff	70.4659	70.2285	69.9912	68.8045	68.5672	67.3805	67.3805	67.1432	67.8552	68.5672	69.0419	69.5165	(39)

Average = Sum(39)m / 12 = 68.7452

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7725	0.7699	0.7673	0.7543	0.7517	0.7387	0.7387	0.7361	0.7439	0.7517	0.7569	0.7621	(40)
HLP (average)												0.7536	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)
Hot water usage for baths	29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)
Hot water usage for other uses	41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 128.5022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)

Total per year (kWh/year) = Sum(64)m = 2479.3192 (64)

12Total per year (kWh/year) 2479 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)	98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)
Total internal gains	524.6232	537.6181	513.3465	493.1932	465.5762	446.7964	427.8529	428.8508	443.3245	460.3566	491.7039	512.5981	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5000	10.6334	0.3300	0.0000	0.7700	17.5626	(74)
North	5.4500	10.6334	0.3300	0.0000	0.7700	14.7256	(74)

West			8.1700		19.6403		0.3300		0.0000		0.7700		40.7731 (80)
Solar gains	73.0614	141.4654	236.2058	359.9908	461.6540	483.2145	455.5678	376.4480	278.8360	168.0941	90.6710	60.4469 (83)	
Total gains	597.6845	679.0835	749.5523	853.1839	927.2302	930.0108	883.4207	805.2988	722.1604	628.4508	582.3749	573.0450 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.9967	87.2907	87.5867	89.0973	89.4057	90.9803	90.9803	91.3019	90.3439	89.4057	88.7910	88.1847	
alpha	6.7998	6.8194	6.8391	6.9398	6.9604	7.0654	7.0654	7.0868	7.0229	6.9604	6.9194	6.8790	
util living area	0.9951	0.9874	0.9637	0.8631	0.6710	0.4626	0.3355	0.3833	0.6371	0.9223	0.9874	0.9962	(86)
MIT	20.2448	20.4027	20.6201	20.8748	20.9798	20.9987	20.9999	20.9997	20.9894	20.8261	20.4993	20.2238	(87)
Th 2	20.2772	20.2795	20.2818	20.2931	20.2954	20.3068	20.3068	20.3091	20.3022	20.2954	20.2909	20.2863	(88)
util rest of house	0.9936	0.9839	0.9539	0.8341	0.6255	0.4130	0.2827	0.3258	0.5772	0.8975	0.9832	0.9951	(89)
MIT 2	19.3916	19.5933	19.8658	20.1724	20.2797	20.3061	20.3068	20.3090	20.2955	20.1270	19.7261	19.3720	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.7129	19.8981	20.1498	20.4369	20.5433	20.5669	20.5678	20.5691	20.5568	20.3903	20.0173	19.6927	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7129	19.8981	20.1498	20.4369	20.5433	20.5669	20.5678	20.5691	20.5568	20.3903	20.0173	19.6927	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9816	0.9518	0.8404	0.6418	0.4317	0.3026	0.3475	0.5994	0.9013	0.9812	0.9939	(94)
Useful gains	593.0102	666.5866	713.4366	716.9962	595.0628	401.4408	267.3102	279.8237	432.8799	566.3968	571.4103	569.5265	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1086.0812	1053.2944	955.3673	793.7909	606.3612	402.0512	267.3503	279.9259	438.1290	671.2911	891.8328	1077.0005	(97)
Space heating kWh	366.8448	259.8676	179.9964	55.2922	8.4060	0.0000	0.0000	0.0000	0.0000	78.0414	230.7042	377.5606	(98a)
Space heating requirement - total per year (kWh/year)												1556.7133	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	366.8448	259.8676	179.9964	55.2922	8.4060	0.0000	0.0000	0.0000	0.0000	78.0414	230.7042	377.5606	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1556.7133	
Space heating per m2										(98c) / (4) =		17.0655	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	366.8448	259.8676	179.9964	55.2922	8.4060	0.0000	0.0000	0.0000	0.0000	78.0414	230.7042	377.5606	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	366.8448	259.8676	179.9964	55.2922	8.4060	0.0000	0.0000	0.0000	0.0000	78.0414	230.7042	377.5606	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601	(231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1556.7133	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	361.6650	
Water heating fuel used	685.5292	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	166.7239	(230a)
Total electricity for the above, kWh/year	166.7239	(231)
Electricity for lighting (calculated in Appendix L)	199.9782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2608.9447	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1556.7133	0.1573	244.9227	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			341.7053	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			393.6950	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1556.7133	1.5824	2463.4044	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	1.5220	1043.4058	(278)
Space and water heating			3506.8102	(279)
Pumps, fans and electric keep-hot	166.7239	1.5128	252.2200	(281)
Energy for lighting	199.9782	1.5338	306.7333	(282)
Total Primary energy kWh/year			4065.7635	(286)
Dwelling Primary energy Rate (DPER)			44.5700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b) x	2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.6110	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1290	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3790	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3221	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4107	0.4027	0.3946	0.3543	0.3463	0.3060	0.3060	0.2980	0.3221	0.3463	0.3624	0.3785	(22b)

Effective ac	0.5843	0.5811	0.5779	0.5628	0.5600	0.5468	0.5468	0.5444	0.5519	0.5600	0.5657	0.5716	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.1200	1.1450	23.0382			(27)
Brickwork	66.3700	20.1200	46.2500	0.1800	8.3250			(29a)
Communal Wall	5.2700	2.0600	3.2100	0.1800	0.5778			(29a)
Stairwell Wall	19.7200		19.7200	0.1800	3.5496			(29a)
Total net area of external elements Aum(A, m2)			91.3600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5506			(33)
Main dwelling								
Party Wall 1			32.1300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	241.9324	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.4700	0.0700	4.1629
E18 Party wall between dwellings	5.7600	0.0600	0.3456
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8900	0.0200	0.0778
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.8900	0.0500	1.6445
E16 Corner (normal)	11.5200	0.0900	1.0368
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.3115	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	48.8621	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.8550	44.6036	44.3572	43.1997	42.9832	41.9751	41.9751	41.7884	42.3634	42.9832	43.4213	43.8792	(38)
Heat transfer coeff	93.7170	93.4656	93.2192	92.0618	91.8452	90.8372	90.8372	90.6505	91.2255	91.8452	92.2833	92.7413	(39)
Average = Sum(39)m / 12 =												92.0608	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0274	1.0246	1.0219	1.0092	1.0069	0.9958	0.9958	0.9938	1.0001	1.0069	1.0117	1.0167	(40)
HLP (average)												1.0092	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6421	(42)
Hot water usage for mixer showers	68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)
Hot water usage for baths	29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)
Hot water usage for other uses	41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)
Average daily hot water use (litres/day)												128.5022	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	267.9943	236.8998	251.2780	219.8328	212.3880	190.5938	187.4632	195.2989	197.8894	221.6191	236.8437	264.9107	(62)
WWHRS	-31.3237	-27.7029	-29.0089	-24.0205	-22.3863	-19.1561	-17.9558	-19.0942	-19.8196	-23.3652	-26.4699	-30.7436	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.6706	209.1968	222.2690	195.8123	190.0017	171.4377	169.5074	176.2047	178.0697	198.2540	210.3738	234.1671	(64)
										Total per year (kWh/year) = Sum(64)m =		2391.9648	(64)
12Total per year (kWh/year)												2392	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	110.8912	98.4442	105.3330	94.1748	92.4021	84.4529	84.1146	86.7200	86.8786	95.4715	99.8310	109.8659	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)	149.0473	146.4944	141.5767	130.7984	124.1964	117.2957	113.0573	116.5591	120.6648	128.3219	138.6541	147.6693	(72)
Total internal gains	577.7252	590.7201	566.4486	546.2952	518.6782	496.8984	477.9549	478.9528	493.4265	513.4587	544.8060	565.7002	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	11.9500	10.6334	0.6300	0.7000	0.7700	38.8339	(74)
West	8.1700	19.6403	0.6300	0.7000	0.7700	49.0390	(80)

Solar gains	87.8729	170.1443	284.0912	432.9707	555.2439	581.1752	547.9239	452.7643	335.3636	202.1714	109.0525	72.7011	(83)
Total gains	665.5981	760.8644	850.5397	979.2659	1073.9221	1078.0736	1025.8788	931.7171	828.7901	715.6301	653.8584	638.4013	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4128	65.5888	65.7622	66.5889	66.7459	67.4867	67.4867	67.6257	67.1994	66.7459	66.4291	66.1010	
alpha	5.3609	5.3726	5.3841	5.4393	5.4497	5.4991	5.4991	5.5084	5.4800	5.4497	5.4286	5.4067	
util living area	0.9941	0.9872	0.9677	0.8936	0.7348	0.5308	0.3883	0.4446	0.7109	0.9385	0.9872	0.9952	(86)
MIT	19.8850	20.0693	20.3469	20.7042	20.9194	20.9887	20.9983	20.9966	20.9500	20.6486	20.2111	19.8589	(87)
Th 2	20.0606	20.0629	20.0651	20.0757	20.0776	20.0868	20.0868	20.0885	20.0833	20.0776	20.0736	20.0695	(88)
util rest of house	0.9923	0.9833	0.9580	0.8648	0.6791	0.4587	0.3084	0.3581	0.6342	0.9147	0.9826	0.9938	(89)
MIT 2	18.7674	19.0027	19.3521	19.7864	20.0138	20.0807	20.0863	20.0873	20.0511	19.7344	19.1924	18.7407	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.1882	19.4044	19.7267	20.1320	20.3548	20.4226	20.4297	20.4297	20.3896	20.0786	19.5760	19.1617	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1882	19.4044	19.7267	20.1320	20.3548	20.4226	20.4297	20.4297	20.3896	20.0786	19.5760	19.1617	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9900	0.9798	0.9537	0.8667	0.6966	0.4856	0.3385	0.3907	0.6610	0.9148	0.9794	0.9918	(94)
Useful gains	658.9550	745.4852	811.1266	848.7641	748.1023	523.4860	347.2790	364.0145	547.8428	654.6232	640.4078	633.1835	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1395.2821	1355.6590	1232.9832	1034.0385	794.9051	528.9059	347.8805	365.2955	573.7680	870.5687	1151.3292	1387.5715	(97)
Space heating kWh	547.8274	410.0368	313.8614	133.3976	34.8213	0.0000	0.0000	0.0000	0.0000	160.6635	367.8635	561.2647	(98a)
Space heating requirement - total per year (kWh/year)												2529.7360	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	547.8274	410.0368	313.8614	133.3976	34.8213	0.0000	0.0000	0.0000	0.0000	160.6635	367.8635	561.2647	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2529.7360	
Space heating per m2											(98c) / (4) =	27.7323	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	547.8274	410.0368	313.8614	133.3976	34.8213	0.0000	0.0000	0.0000	0.0000	160.6635	367.8635	561.2647	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	593.5291	444.2436	340.0448	144.5261	37.7262	0.0000	0.0000	0.0000	0.0000	174.0666	398.5520	608.0874	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	236.6706	209.1968	222.2690	195.8123	190.0017	171.4377	169.5074	176.2047	178.0697	198.2540	210.3738	234.1671	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8780	85.5408	84.8334	83.2176	81.0726	79.8000	79.8000	79.8000	79.8000	83.5924	85.3000	85.9464	(217)
Fuel for water heating, kWh/month	275.5892	244.5580	262.0064	235.3015	234.3599	214.8342	212.4152	220.8079	223.1450	237.1673	246.6283	272.4571	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.2957	20.2932	18.2717	13.3867	10.3402	8.4481	9.4327	12.2610	15.9258	20.8956	23.6015	25.9988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.1402	-35.6046	-53.5094	-62.9858	-70.3728	-66.5635	-65.7299	-60.8239	-52.6145	-41.9297	-27.0849	-20.6899	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2508	-19.8354	-40.1368	-61.3477	-82.1777	-82.9765	-82.0211	-68.9772	-49.9301	-28.7356	-12.4671	-7.2891	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2740.7758	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2879.2700	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.1510	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1127.1943	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4783.0025	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2740.7758	0.2100	575.5629	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2879.2700	0.2100	604.6467	(264)
Space and water heating			1180.2096	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.1510	0.1443	29.4653	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.0490	0.1337	-77.7943	
PV Unit electricity exported	-545.1453	0.1254	-68.3500	
Total			-146.1443	(269)
Total CO2, kg/year			1075.4599	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2740.7758	1.1300	3097.0766	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2879.2700	1.1300	3253.5751	(278)
Space and water heating			6350.6517	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.1510	1.5338	313.1336	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.0490	1.4939	-869.5328	
PV Unit electricity exported	-545.1453	0.4602	-250.8778	
Total			-1120.4106	(283)
Total Primary energy kWh/year			5673.4755	(286)
Target Primary Energy Rate (TPER)			62.2000	(287)

Full SAP Calculation Printout

Plot Reference	P-16	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-16
Plot Address	Flat 7, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.32	**TER**	11.79
Environmental	96 A	**% DER < TER**			63.36
CO_2 Emissions (t/year)	0.31	**DFEE**	33.25	**TFEE**	34.50
Compliance Check	See BREL	**% DFEE < TFEE**			3.62
% DPER < TPER	28.34	**DPER**	44.57	**TPER**	62.20

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	232.6110	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1290 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9100 (17)
Infiltration rate		0.2745 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2333 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2975	0.2916	0.2858	0.2566	0.2508	0.2216	0.2216	0.2158	0.2333	0.2508	0.2625	0.2741	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5442	0.5425	0.5408	0.5329	0.5314	0.5246	0.5246	0.5233	0.5272	0.5314	0.5344	0.5376	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Brickwork	66.3700	20.1200	46.2500	0.2100	9.7125	110.0000	5087.5003	(29a)
Communal Wall	5.2700	2.0600	3.2100	0.2200	0.7062	110.0000	353.1000	(29a)
Stairwell Wall	19.7200		19.7200	0.2200	4.3384	110.0000	2169.1999	(29a)
Total net area of external elements Aum(A, m2)			91.3600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2673			(33)
Main dwelling								
Party Wall 1			32.1300	0.0000	0.0000	110.0000	3534.3001	(32)
Party Floor 1			91.2200			70.0000	6385.4000	(32d)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			200.3300			9.0000	1802.9700	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22069.0704 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 241.9324 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	59.4700	0.0380	2.2599	
E18 Party wall between dwellings	5.7600	0.0380	0.2189	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.3200	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8900	0.3300	1.2837	
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695	
E4 Jamb	32.8900	0.0160	0.5262	
E16 Corner (normal)	11.5200	0.0540	0.6221	
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587	
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.6548 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	47.9221 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.7768	41.6449	41.5157	40.9085	40.7949	40.2662	40.2662	40.1682	40.4698	40.7949	41.0247	41.2650	(38)
Heat transfer coeff	89.6989	89.5670	89.4377	88.8306	88.7170	88.1882	88.1882	88.0903	88.3919	88.7170	88.9468	89.1871	(39)
Average = Sum(39)m / 12 =												88.8301	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9833	0.9819	0.9805	0.9738	0.9726	0.9668	0.9668	0.9657	0.9690	0.9726	0.9751	0.9777	(40)
HLP (average)												0.9738	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 65.3306 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2756	69.3203	67.1856	64.5287	62.1585	59.6952	59.1835	61.3139	63.4989	66.0284	68.7088	71.1756	(44)
Energy conte	112.8831	98.7112	103.2617	88.3366	83.6772	73.4022	71.5773	75.9194	78.3004	89.6000	97.8883	111.4438	(45)
Energy content (annual)											Total = Sum(45)m =	1085.0013	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

95.9507	83.9045	87.7725	75.0861	71.1256	62.3919	60.8407	64.5315	66.5554	76.1600	83.2050	94.7272	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

95.9507	83.9045	87.7725	75.0861	71.1256	62.3919	60.8407	64.5315	66.5554	76.1600	83.2050	94.7272	(64)
									Total per year (kWh/year) = Sum(64)m =		922.2511	(64)
12Total per year (kWh/year)											922	(64)

Electric shower(s)

54.8717	48.8912	53.3873	50.9468	51.9028	49.5103	51.1606	51.9028	50.9468	53.3873	52.3834	54.8717	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							624.1629	(64a)

Heat gains from water heating, kWh/month

37.7056	33.1989	35.2899	31.5082	30.7571	27.9755	28.0003	29.1086	29.3756	32.3868	33.8971	37.3997	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)	50.6796	49.4031	47.4327	43.7614	41.3402	38.8549	37.6349	39.1244	40.7994	43.5307	47.0793	50.2685	(72)
Total internal gains	476.3575	490.6289	469.3046	456.2583	432.8220	418.4577	402.5325	401.5181	413.5611	425.6675	450.2312	465.2994	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5000	10.6334	0.3300	0.0000	0.7700	17.5626	(74)
North	5.4500	10.6334	0.3300	0.0000	0.7700	14.7256	(74)
West	8.1700	19.6403	0.3300	0.0000	0.7700	40.7731	(80)

Solar gains	73.0614	141.4654	236.2058	359.9908	461.6540	483.2145	455.5678	376.4480	278.8360	168.0941	90.6710	60.4469	(83)
Total gains	549.4188	632.0942	705.5104	816.2490	894.4760	901.6721	858.1004	777.9661	692.3971	593.7616	540.9022	525.7463	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.3431	68.4437	68.5426	69.0111	69.0994	69.5138	69.5138	69.5910	69.3536	69.0994	68.9209	68.7353	
alpha	5.5562	5.5629	5.5695	5.6007	5.6066	5.6343	5.6343	5.6394	5.6236	5.6066	5.5947	5.5824	
util living area	0.9976	0.9943	0.9844	0.9385	0.8124	0.6085	0.4493	0.5145	0.7904	0.9682	0.9945	0.9981	(86)
MIT	19.8177	19.9871	20.2498	20.6149	20.8772	20.9803	20.9970	20.9938	20.9218	20.5662	20.1293	19.7869	(87)
Th 2	20.0973	20.0985	20.0996	20.1052	20.1063	20.1111	20.1111	20.1120	20.1092	20.1063	20.1042	20.1019	(88)
util rest of house	0.9968	0.9924	0.9792	0.9189	0.7622	0.5312	0.3601	0.4185	0.7185	0.9541	0.9924	0.9975	(89)
MIT 2	19.0152	19.1847	19.4452	19.7993	20.0265	20.1024	20.1103	20.1102	20.0672	19.7609	19.3313	18.9882	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.3174	19.4868	19.7482	20.1064	20.3468	20.4330	20.4442	20.4429	20.3890	20.0642	19.6318	19.2890	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3174	19.4868	19.7482	20.1064	20.3468	20.4330	20.4442	20.4429	20.3890	20.0642	19.6318	19.2890	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9959	0.9908	0.9767	0.9189	0.7767	0.5599	0.3938	0.4547	0.7428	0.9533	0.9909	0.9968	(94)
Useful gains	547.1826	626.2976	689.0651	750.0427	694.7036	504.8153	337.9155	353.7755	514.3059	566.0302	535.9872	524.0563	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1347.0442	1306.4976	1184.8890	995.4732	767.1204	514.3993	339.0130	356.1446	555.8994	839.6332	1114.6642	1345.7413	(97)
Space heating kWh	595.0970	457.0944	368.8930	176.7099	53.8781	0.0000	0.0000	0.0000	0.0000	203.5606	416.6475	611.3336	(98a)
Space heating requirement - total per year (kWh/year)												2883.2141	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	595.0970	457.0944	368.8930	176.7099	53.8781	0.0000	0.0000	0.0000	0.0000	203.5606	416.6475	611.3336	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2883.2141	
Space heating per m2											(98c) / (4) =	31.6073	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	828.9695	652.5930	669.4865	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9182	0.9601	0.9351	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	761.1698	626.5721	626.0565	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1005.9686	957.4011	866.1268	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	176.2551	246.1368	178.6123	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	44.0638	61.5342	44.6531	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												150.2511	(107)
Energy for space heating												31.6073	(99)
Energy for space cooling												1.6471	(108)
Total												33.2544	(109)
Fabric Energy Efficiency (DFEE)												33.3	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		232.6110	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1290	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3790	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3221	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4107	0.4027	0.3946	0.3543	0.3463	0.3060	0.3060	0.2980	0.3221	0.3463	0.3624	0.3785	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5843	0.5811	0.5779	0.5628	0.5600	0.5468	0.5468	0.5444	0.5519	0.5600	0.5657	0.5716	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.1200	1.1450	23.0382			(27)
Brickwork	66.3700	20.1200	46.2500	0.1800	8.3250			(29a)
Communal Wall	5.2700	2.0600	3.2100	0.1800	0.5778			(29a)
Stairwell Wall	19.7200		19.7200	0.1800	3.5496			(29a)
Total net area of external elements Aum(A, m2)			91.3600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5506			(33)
Main dwelling								
Party Wall 1			32.1300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	241.9324	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.4700	0.0700	4.1629
E18 Party wall between dwellings	5.7600	0.0600	0.3456
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8900	0.0200	0.0778
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.8900	0.0500	1.6445
E16 Corner (normal)	11.5200	0.0900	1.0368
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.3115	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 48.8621	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.8550	44.6036	44.3572	43.1997	42.9832	41.9751	41.9751	41.7884	42.3634	42.9832	43.4213	43.8792	(38)
Heat transfer coeff	93.7170	93.4656	93.2192	92.0618	91.8452	90.8372	90.8372	90.6505	91.2255	91.8452	92.2833	92.7413	(39)
Average = Sum(39)m / 12 =												92.0608	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0274	1.0246	1.0219	1.0092	1.0069	0.9958	0.9958	0.9938	1.0001	1.0069	1.0117	1.0167	(40)
HLP (average)												1.0092	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6421	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day)	65.3306	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2756	69.3203	67.1856	64.5287	62.1585	59.6952	59.1835	61.3139	63.4989	66.0284	68.7088	71.1756	(44)
Energy conte	112.8831	98.7112	103.2617	88.3366	83.6772	73.4022	71.5773	75.9194	78.3004	89.6000	97.8883	111.4438	(45)
Energy content (annual)										Total = Sum(45)m =		1085.0013	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.9507	83.9045	87.7725	75.0861	71.1256	62.3919	60.8407	64.5315	66.5554	76.1600	83.2050	94.7272	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.9507	83.9045	87.7725	75.0861	71.1256	62.3919	60.8407	64.5315	66.5554	76.1600	83.2050	94.7272	(64)
										Total per year (kWh/year) = Sum(64)m =		922.2511	(64)
12Total per year (kWh/year)												922	(64)
Electric shower(s)	54.8717	48.8912	53.3873	50.9468	51.9028	49.5103	51.1606	51.9028	50.9468	53.3873	52.3834	54.8717	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		624.1629	(64a)
Heat gains from water heating, kWh/month	37.7056	33.1989	35.2899	31.5082	30.7571	27.9755	28.0003	29.1086	29.3756	32.3868	33.8971	37.3997	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)													
	50.6796	49.4031	47.4327	43.7614	41.3402	38.8549	37.6349	39.1244	40.7994	43.5307	47.0793	50.2685	(72)
Total internal gains													
	476.3575	490.6289	469.3046	456.2583	432.8220	418.4577	402.5325	401.5181	413.5611	425.6675	450.2312	465.2994	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	11.9500	10.6334	0.6300	0.7000	0.7700	38.8339	(74)
West	8.1700	19.6403	0.6300	0.7000	0.7700	49.0390	(80)

Solar gains	87.8729	170.1443	284.0912	432.9707	555.2439	581.1752	547.9239	452.7643	335.3636	202.1714	109.0525	72.7011	(83)
Total gains	564.2304	660.7731	753.3958	889.2290	988.0659	999.6329	950.4564	854.2824	748.9247	627.8389	559.2836	538.0005	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4128	65.5888	65.7622	66.5889	66.7459	67.4867	67.4867	67.6257	67.1994	66.7459	66.4291	66.1010	
alpha	5.3609	5.3726	5.3841	5.4393	5.4497	5.4991	5.4991	5.5084	5.4800	5.4497	5.4286	5.4067	
util living area													
	0.9973	0.9932	0.9805	0.9226	0.7775	0.5688	0.4184	0.4833	0.7639	0.9627	0.9937	0.9979	(86)
MIT	19.7629	19.9522	20.2427	20.6365	20.8935	20.9842	20.9975	20.9948	20.9289	20.5654	20.1001	19.7371	(87)
Th 2	20.0606	20.0629	20.0651	20.0757	20.0776	20.0868	20.0868	20.0885	20.0833	20.0776	20.0736	20.0695	(88)
util rest of house													
	0.9964	0.9911	0.9742	0.8992	0.7237	0.4931	0.3327	0.3900	0.6887	0.9465	0.9914	0.9972	(89)
MIT 2	18.9315	19.1215	19.4096	19.7917	20.0102	20.0800	20.0862	20.0871	20.0460	19.7354	19.2779	18.9128	(90)
Living area fraction									fLA = Living area / (4) =			0.3766	(91)
MIT	19.2446	19.4343	19.7233	20.1098	20.3428	20.4205	20.4294	20.4289	20.3785	20.0479	19.5875	19.2232	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2446	19.4343	19.7233	20.1098	20.3428	20.4205	20.4294	20.4289	20.3785	20.0479	19.5875	19.2232	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9892	0.9713	0.9002	0.7400	0.5213	0.3651	0.4252	0.7146	0.9459	0.9897	0.9964	(94)
Useful gains	561.6471	653.6365	731.7854	800.4714	731.2157	521.0933	346.9719	363.2772	535.1522	593.8702	553.5432	536.0708	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1400.5617	1358.4601	1232.6654	1031.9968	793.8022	528.7167	347.8500	365.2236	572.7573	867.7471	1152.3891	1393.2720	(97)
Space heating kWh													
	624.1525	473.6415	372.6547	166.6983	46.5644	0.0000	0.0000	0.0000	0.0000	203.7644	431.1690	637.7576	(98a)
Space heating requirement - total per year (kWh/year)												2956.4024	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	624.1525	473.6415	372.6547	166.6983	46.5644	0.0000	0.0000	0.0000	0.0000	203.7644	431.1690	637.7576	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2956.4024	
Space heating per m2											(98c) / (4) =	32.4096	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	853.8692	672.1949	688.9436	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9356	0.9691	0.9477	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	798.8687	651.4409	652.9181	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1120.4682	1065.3497	955.3276	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	231.5517	307.9482	224.9927	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	57.8879	76.9870	56.2482	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												191.1231	(107)
Energy for space heating												32.4096	(99)
Energy for space cooling												2.0952	(108)
Total												34.5048	(109)
Fabric Energy Efficiency (TFEE)												34.5	(109)

Full SAP Calculation Printout

Plot Reference	P-16	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-16
Plot Address	Flat 7, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.32	**TER**	11.79
Environmental	96 A	**% DER < TER**			63.36
CO_2 Emissions (t/year)	0.31	**DFEE**	33.25	**TFEE**	34.50
Compliance Check	See BREL	**% DFEE < TFEE**			3.62
% DPER < TPER	28.34	**DPER**	44.57	**TPER**	62.20

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	232.6110	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9100	(17)
Infiltration rate		0.1455	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1237	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1577	0.1546	0.1515	0.1360	0.1330	0.1175	0.1175	0.1144	0.1237	0.1330	0.1391	0.1453	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

Effective ac	0.2937	0.2906	0.2875	0.2720	0.2690	0.2535	0.2535	0.2504	0.2597	0.2690	0.2751	0.2813	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Brickwork	66.3700	20.1200	46.2500	0.2100	9.7125	110.0000	5087.5003	(29a)
Communal Wall	5.2700	2.0600	3.2100	0.2200	0.7062	110.0000	353.1000	(29a)
Stairwell Wall	19.7200		19.7200	0.2200	4.3384	110.0000	2169.1999	(29a)
Total net area of external elements Aum(A, m2)			91.3600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2673			(33)
Main dwelling								
Party Wall 1			32.1300	0.0000	0.0000	110.0000	3534.3001	(32)
Party Floor 1			91.2200			70.0000	6385.4000	(32d)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			200.3300			9.0000	1802.9700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22069.0704 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 241.9324 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.4700	0.0380	2.2599
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8900	0.3300	1.2837
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.8900	0.0160	0.5262
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6548 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.9221 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.5438	22.3064	22.0691	20.8824	20.6451	19.4584	19.4584	19.2211	19.9331	20.6451	21.1198	21.5944	(38)
Heat transfer coeff	70.4659	70.2285	69.9912	68.8045	68.5672	67.3805	67.3805	67.1432	67.8552	68.5672	69.0419	69.5165	(39)

Average = Sum(39)m / 12 = 68.7452

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7725	0.7699	0.7673	0.7543	0.7517	0.7387	0.7387	0.7361	0.7439	0.7517	0.7569	0.7621	(40)
HLP (average)												0.7536	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)
Hot water usage for baths	29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)
Hot water usage for other uses	41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 128.5022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)

Total per year (kWh/year) = Sum(64)m = 2479.3192 (64)

12Total per year (kWh/year) 2479 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)	98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)
Total internal gains	524.6232	537.6181	513.3465	493.1932	465.5762	446.7964	427.8529	428.8508	443.3245	460.3566	491.7039	512.5981	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5000	10.6334	0.3300	0.0000	0.7700	17.5626	(74)
North	5.4500	10.6334	0.3300	0.0000	0.7700	14.7256	(74)

West			8.1700		19.6403		0.3300		0.0000		0.7700		40.7731 (80)
Solar gains	73.0614	141.4654	236.2058	359.9908	461.6540	483.2145	455.5678	376.4480	278.8360	168.0941	90.6710	60.4469 (83)	
Total gains	597.6845	679.0835	749.5523	853.1839	927.2302	930.0108	883.4207	805.2988	722.1604	628.4508	582.3749	573.0450 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.9967	87.2907	87.5867	89.0973	89.4057	90.9803	90.9803	91.3019	90.3439	89.4057	88.7910	88.1847	
alpha	6.7998	6.8194	6.8391	6.9398	6.9604	7.0654	7.0654	7.0868	7.0229	6.9604	6.9194	6.8790	
util living area	0.9951	0.9874	0.9637	0.8631	0.6710	0.4626	0.3355	0.3833	0.6371	0.9223	0.9874	0.9962	(86)
MIT	20.2448	20.4027	20.6201	20.8748	20.9798	20.9987	20.9999	20.9997	20.9894	20.8261	20.4993	20.2238	(87)
Th 2	20.2772	20.2795	20.2818	20.2931	20.2954	20.3068	20.3068	20.3091	20.3022	20.2954	20.2909	20.2863	(88)
util rest of house	0.9936	0.9839	0.9539	0.8341	0.6255	0.4130	0.2827	0.3258	0.5772	0.8975	0.9832	0.9951	(89)
MIT 2	19.3916	19.5933	19.8658	20.1724	20.2797	20.3061	20.3068	20.3090	20.2955	20.1270	19.7261	19.3720	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.7129	19.8981	20.1498	20.4369	20.5433	20.5669	20.5678	20.5691	20.5568	20.3903	20.0173	19.6927	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7129	19.8981	20.1498	20.4369	20.5433	20.5669	20.5678	20.5691	20.5568	20.3903	20.0173	19.6927	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9816	0.9518	0.8404	0.6418	0.4317	0.3026	0.3475	0.5994	0.9013	0.9812	0.9939	(94)
Useful gains	593.0102	666.5866	713.4366	716.9962	595.0628	401.4408	267.3102	279.8237	432.8799	566.3968	571.4103	569.5265	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1086.0812	1053.2944	955.3673	793.7909	606.3612	402.0512	267.3503	279.9259	438.1290	671.2911	891.8328	1077.0005	(97)
Space heating kWh	366.8448	259.8676	179.9964	55.2922	8.4060	0.0000	0.0000	0.0000	0.0000	78.0414	230.7042	377.5606	(98a)
Space heating requirement - total per year (kWh/year)												1556.7133	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	366.8448	259.8676	179.9964	55.2922	8.4060	0.0000	0.0000	0.0000	0.0000	78.0414	230.7042	377.5606	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1556.7133	
Space heating per m2										(98c) / (4) =		17.0655	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	366.8448	259.8676	179.9964	55.2922	8.4060	0.0000	0.0000	0.0000	0.0000	78.0414	230.7042	377.5606	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	366.8448	259.8676	179.9964	55.2922	8.4060	0.0000	0.0000	0.0000	0.0000	78.0414	230.7042	377.5606	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601	(231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1556.7133	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	361.6650	
Water heating fuel used	685.5292	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	166.7239	(230a)
Total electricity for the above, kWh/year	166.7239	(231)
Electricity for lighting (calculated in Appendix L)	199.9782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2608.9447	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1556.7133	0.1573	244.9227	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			341.7053	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			393.6950	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1556.7133	1.5824	2463.4044	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	1.5220	1043.4058	(278)
Space and water heating			3506.8102	(279)
Pumps, fans and electric keep-hot	166.7239	1.5128	252.2200	(281)
Energy for lighting	199.9782	1.5338	306.7333	(282)
Total Primary energy kWh/year			4065.7635	(286)
Dwelling Primary energy Rate (DPER)			44.5700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b) x	2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.6110	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1290	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3790	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3221	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4107	0.4027	0.3946	0.3543	0.3463	0.3060	0.3060	0.2980	0.3221	0.3463	0.3624	0.3785	(22b)

Effective ac	0.5843	0.5811	0.5779	0.5628	0.5600	0.5468	0.5468	0.5444	0.5519	0.5600	0.5657	0.5716	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.1200	1.1450	23.0382			(27)
Brickwork	66.3700	20.1200	46.2500	0.1800	8.3250			(29a)
Communal Wall	5.2700	2.0600	3.2100	0.1800	0.5778			(29a)
Stairwell Wall	19.7200		19.7200	0.1800	3.5496			(29a)
Total net area of external elements Aum(A, m2)			91.3600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5506			(33)
Main dwelling								
Party Wall 1			32.1300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	241.9324	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.4700	0.0700	4.1629
E18 Party wall between dwellings	5.7600	0.0600	0.3456
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8900	0.0200	0.0778
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.8900	0.0500	1.6445
E16 Corner (normal)	11.5200	0.0900	1.0368
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.3115	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	48.8621	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	44.8550	44.6036	44.3572	43.1997	42.9832	41.9751	41.9751	41.7884	42.3634	42.9832	43.4213	43.8792	(38)
Heat transfer coeff	93.7170	93.4656	93.2192	92.0618	91.8452	90.8372	90.8372	90.6505	91.2255	91.8452	92.2833	92.7413	(39)
Average = Sum(39)m / 12 =												92.0608	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0274	1.0246	1.0219	1.0092	1.0069	0.9958	0.9958	0.9938	1.0001	1.0069	1.0117	1.0167	(40)
HLP (average)												1.0092	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6421	(42)
Hot water usage for mixer showers	68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)
Hot water usage for baths	29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)
Hot water usage for other uses	41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)
Average daily hot water use (litres/day)												128.5022	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	267.9943	236.8998	251.2780	219.8328	212.3880	190.5938	187.4632	195.2989	197.8894	221.6191	236.8437	264.9107	(62)
WWHRS	-31.3237	-27.7029	-29.0089	-24.0205	-22.3863	-19.1561	-17.9558	-19.0942	-19.8196	-23.3652	-26.4699	-30.7436	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.6706	209.1968	222.2690	195.8123	190.0017	171.4377	169.5074	176.2047	178.0697	198.2540	210.3738	234.1671	(64)
										Total per year (kWh/year) = Sum(64)m =		2391.9648	(64)
12Total per year (kWh/year)												2392	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	110.8912	98.4442	105.3330	94.1748	92.4021	84.4529	84.1146	86.7200	86.8786	95.4715	99.8310	109.8659	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	132.1027	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.7427	134.7865	121.7427	125.8008	121.7427	125.8008	121.7427	121.7427	125.8008	121.7427	125.8008	121.7427	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.3044	243.8084	237.4984	224.0653	207.1083	191.1712	180.5242	178.0202	184.3302	197.7633	214.7203	230.6574	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	36.2103	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)	149.0473	146.4944	141.5767	130.7984	124.1964	117.2957	113.0573	116.5591	120.6648	128.3219	138.6541	147.6693	(72)
Total internal gains	577.7252	590.7201	566.4486	546.2952	518.6782	496.8984	477.9549	478.9528	493.4265	513.4587	544.8060	565.7002	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	11.9500	10.6334	0.6300	0.7000	0.7700	38.8339	(74)
West	8.1700	19.6403	0.6300	0.7000	0.7700	49.0390	(80)

Solar gains	87.8729	170.1443	284.0912	432.9707	555.2439	581.1752	547.9239	452.7643	335.3636	202.1714	109.0525	72.7011	(83)
Total gains	665.5981	760.8644	850.5397	979.2659	1073.9221	1078.0736	1025.8788	931.7171	828.7901	715.6301	653.8584	638.4013	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4128	65.5888	65.7622	66.5889	66.7459	67.4867	67.4867	67.6257	67.1994	66.7459	66.4291	66.1010	
alpha	5.3609	5.3726	5.3841	5.4393	5.4497	5.4991	5.4991	5.5084	5.4800	5.4497	5.4286	5.4067	
util living area	0.9941	0.9872	0.9677	0.8936	0.7348	0.5308	0.3883	0.4446	0.7109	0.9385	0.9872	0.9952	(86)
MIT	19.8850	20.0693	20.3469	20.7042	20.9194	20.9887	20.9983	20.9966	20.9500	20.6486	20.2111	19.8589	(87)
Th 2	20.0606	20.0629	20.0651	20.0757	20.0776	20.0868	20.0868	20.0885	20.0833	20.0776	20.0736	20.0695	(88)
util rest of house	0.9923	0.9833	0.9580	0.8648	0.6791	0.4587	0.3084	0.3581	0.6342	0.9147	0.9826	0.9938	(89)
MIT 2	18.7674	19.0027	19.3521	19.7864	20.0138	20.0807	20.0863	20.0873	20.0511	19.7344	19.1924	18.7407	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.1882	19.4044	19.7267	20.1320	20.3548	20.4226	20.4297	20.4297	20.3896	20.0786	19.5760	19.1617	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1882	19.4044	19.7267	20.1320	20.3548	20.4226	20.4297	20.4297	20.3896	20.0786	19.5760	19.1617	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9900	0.9798	0.9537	0.8667	0.6966	0.4856	0.3385	0.3907	0.6610	0.9148	0.9794	0.9918	(94)
Useful gains	658.9550	745.4852	811.1266	848.7641	748.1023	523.4860	347.2790	364.0145	547.8428	654.6232	640.4078	633.1835	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1395.2821	1355.6590	1232.9832	1034.0385	794.9051	528.9059	347.8805	365.2955	573.7680	870.5687	1151.3292	1387.5715	(97)
Space heating kWh	547.8274	410.0368	313.8614	133.3976	34.8213	0.0000	0.0000	0.0000	0.0000	160.6635	367.8635	561.2647	(98a)
Space heating requirement - total per year (kWh/year)												2529.7360	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	547.8274	410.0368	313.8614	133.3976	34.8213	0.0000	0.0000	0.0000	0.0000	160.6635	367.8635	561.2647	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2529.7360	
Space heating per m2											(98c) / (4) =	27.7323	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	547.8274	410.0368	313.8614	133.3976	34.8213	0.0000	0.0000	0.0000	0.0000	160.6635	367.8635	561.2647	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	593.5291	444.2436	340.0448	144.5261	37.7262	0.0000	0.0000	0.0000	0.0000	174.0666	398.5520	608.0874	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	236.6706	209.1968	222.2690	195.8123	190.0017	171.4377	169.5074	176.2047	178.0697	198.2540	210.3738	234.1671	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8780	85.5408	84.8334	83.2176	81.0726	79.8000	79.8000	79.8000	79.8000	83.5924	85.3000	85.9464	(217)
Fuel for water heating, kWh/month	275.5892	244.5580	262.0064	235.3015	234.3599	214.8342	212.4152	220.8079	223.1450	237.1673	246.6283	272.4571	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.2957	20.2932	18.2717	13.3867	10.3402	8.4481	9.4327	12.2610	15.9258	20.8956	23.6015	25.9988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.1402	-35.6046	-53.5094	-62.9858	-70.3728	-66.5635	-65.7299	-60.8239	-52.6145	-41.9297	-27.0849	-20.6899	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.2508	-19.8354	-40.1368	-61.3477	-82.1777	-82.9765	-82.0211	-68.9772	-49.9301	-28.7356	-12.4671	-7.2891	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2740.7758	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2879.2700	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.1510	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1127.1943	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4783.0025	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2740.7758	0.2100	575.5629	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2879.2700	0.2100	604.6467	(264)
Space and water heating			1180.2096	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.1510	0.1443	29.4653	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.0490	0.1337	-77.7943	
PV Unit electricity exported	-545.1453	0.1254	-68.3500	
Total			-146.1443	(269)
Total CO2, kg/year			1075.4599	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2740.7758	1.1300	3097.0766	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2879.2700	1.1300	3253.5751	(278)
Space and water heating			6350.6517	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.1510	1.5338	313.1336	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-582.0490	1.4939	-869.5328	
PV Unit electricity exported	-545.1453	0.4602	-250.8778	
Total			-1120.4106	(283)
Total Primary energy kWh/year			5673.4755	(286)
Target Primary Energy Rate (TPER)			62.2000	(287)

Full SAP Calculation Printout

Plot Reference	P-16	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-16
Plot Address	Flat 7, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.32	**TER**	11.79
Environmental	96 A	**% DER < TER**			63.36
CO_2 Emissions (t/year)	0.31	**DFEE**	33.25	**TFEE**	34.50
Compliance Check	See BREL	**% DFEE < TFEE**			3.62
% DPER < TPER	28.34	**DPER**	44.57	**TPER**	62.20

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	232.6110	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9100 (17)
Infiltration rate		0.1455 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1237 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1577	0.1546	0.1515	0.1360	0.1330	0.1175	0.1175	0.1144	0.1237	0.1330	0.1391	0.1453	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2937	0.2906	0.2875	0.2720	0.2690	0.2535	0.2535	0.2504	0.2597	0.2690	0.2751	0.2813	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Brickwork	66.3700	20.1200	46.2500	0.2100	9.7125	110.0000	5087.5003	(29a)
Communal Wall	5.2700	2.0600	3.2100	0.2200	0.7062	110.0000	353.1000	(29a)
Stairwell Wall	19.7200		19.7200	0.2200	4.3384	110.0000	2169.1999	(29a)
Total net area of external elements Aum(A, m2)			91.3600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2673			(33)
Main dwelling								
Party Wall 1			32.1300	0.0000	0.0000	110.0000	3534.3001	(32)
Party Floor 1			91.2200			70.0000	6385.4000	(32d)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			200.3300			9.0000	1802.9700	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22069.0704	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 241.9324 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.4700	0.0380	2.2599
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8900	0.3300	1.2837
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.8900	0.0160	0.5262
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6548 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.9221 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.5438	22.3064	22.0691	20.8824	20.6451	19.4584	19.4584	19.2211	19.9331	20.6451	21.1198	21.5944	(38)
Heat transfer coeff	70.4659	70.2285	69.9912	68.8045	68.5672	67.3805	67.3805	67.1432	67.8552	68.5672	69.0419	69.5165	(39)

Average = Sum(39)m / 12 = 68.7452

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7725	0.7699	0.7673	0.7543	0.7517	0.7387	0.7387	0.7361	0.7439	0.7517	0.7569	0.7621	(40)
HLP (average)												0.7536	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)
Hot water usage for mixer showers

68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 128.5022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss, Combi loss

Total heat required for water heating calculated for each month

250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS, PV diverter, Solar input, FGHRS

Output from w/h

250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
									Total per year (kWh/year) = Sum(64)m =		2479.3192	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

28.3090	25.1438	20.4483	15.4807	11.5720	9.7696	10.5564	13.7216	18.4170	23.3847	27.2934	29.0958	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

360.1558	363.8931	354.4752	334.4258	309.1169	285.3301	269.4391	265.7018	275.1196	295.1691	320.4780	344.2648	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	(69)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Pumps, fans

Losses e.g. evaporation (negative values) (Table 5)

-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)

Water heating gains (Table 5)

98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)

Total internal gains

593.7455	591.7647	572.7336	536.9382	501.1187	468.6287	449.2861	452.2159	470.4349	503.1091	542.6589	577.2632	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5000	10.6334	0.3300	0.0000	0.7700	17.5626	(74)
North	5.4500	10.6334	0.3300	0.0000	0.7700	14.7256	(74)
West	8.1700	19.6403	0.3300	0.0000	0.7700	40.7731	(80)

Solar gains	73.0614	141.4654	236.2058	359.9908	461.6540	483.2145	455.5678	376.4480	278.8360	168.0941	90.6710	60.4469	(83)
Total gains	666.8069	733.2301	808.9394	896.9290	962.7727	951.8432	904.8539	828.6639	749.2708	671.2032	633.3299	637.7101	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.9967	87.2907	87.5867	89.0973	89.4057	90.9803	90.9803	91.3019	90.3439	89.4057	88.7910	88.1847	
alpha	6.7998	6.8194	6.8391	6.9398	6.9604	7.0654	7.0654	7.0868	7.0229	6.9604	6.9194	6.8790	
util living area	0.9908	0.9810	0.9482	0.8392	0.6491	0.4521	0.3276	0.3725	0.6160	0.8992	0.9801	0.9929	(86)
MIT	20.3304	20.4660	20.6781	20.8961	20.9834	20.9989	20.9999	20.9998	20.9914	20.8573	20.5588	20.3048	(87)
Th 2	20.2772	20.2795	20.2818	20.2931	20.2954	20.3068	20.3068	20.3091	20.3022	20.2954	20.2909	20.2863	(88)
util rest of house	0.9882	0.9760	0.9353	0.8081	0.6042	0.4036	0.2760	0.3167	0.5574	0.8701	0.9739	0.9909	(89)
MIT 2	19.4999	19.6724	19.9351	20.1945	20.2826	20.3062	20.3068	20.3090	20.2968	20.1604	19.7999	19.4749	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.8126	19.9712	20.2149	20.4586	20.5465	20.5670	20.5678	20.5691	20.5584	20.4228	20.0857	19.7874	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8126	19.9712	20.2149	20.4586	20.5465	20.5670	20.5678	20.5691	20.5584	20.4228	20.0857	19.7874	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9734	0.9339	0.8158	0.6204	0.4218	0.2954	0.3377	0.5792	0.8759	0.9717	0.9891	(94)
Useful gains	657.5880	713.6907	755.4894	731.7030	597.3402	401.5328	267.3168	279.8431	433.9680	587.8943	615.4020	630.7617	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1093.1110	1058.4297	959.9220	795.2872	606.5802	402.0600	267.3510	279.9278	438.2330	673.5233	896.5571	1083.5800	(97)
Space heating kWh	324.0291	231.6646	152.0979	45.7806	6.8746	0.0000	0.0000	0.0000	0.0000	63.7080	202.4316	336.8968	(98a)
Space heating requirement - total per year (kWh/year)												1363.4831	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	324.0291	231.6646	152.0979	45.7806	6.8746	0.0000	0.0000	0.0000	0.0000	63.7080	202.4316	336.8968	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1363.4831	
Space heating per m2											(98c) / (4) =	14.9472	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	324.0291	231.6646	152.0979	45.7806	6.8746	0.0000	0.0000	0.0000	0.0000	63.7080	202.4316	336.8968	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	324.0291	231.6646	152.0979	45.7806	6.8746	0.0000	0.0000	0.0000	0.0000	63.7080	202.4316	336.8968	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601	(231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1363.4831	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	685.5292	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	166.7239	(230a)
Total electricity for the above, kWh/year	166.7239	(231)
Electricity for lighting (calculated in Appendix L)	199.9782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2415.7145	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1363.4831	16.4900	224.8384	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	16.4900	113.0438	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	166.7239	16.4900	27.4928	(249)
Energy for lighting	199.9782	16.4900	32.9764	(250)
Additional standing charges			0.0000	(251)
Total energy cost			398.3513	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0528	(257)
SAP value		82.9348	
SAP rating (Section 12)		83	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1363.4831	0.1575	214.7538	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			311.5364	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			363.5261	(272)
CO2 emissions per m2			3.9900	(273)
EI value			96.4240	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b) x	2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		232.6110	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	2.9100	(17)
Infiltration rate	0.1455	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1237	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1330	0.1268	0.1268	0.1175	0.1206	0.1051	0.1051	0.1020	0.1051	0.1175	0.1144	0.1237	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2690	0.2628	0.2628	0.2535	0.2566	0.2411	0.2411	0.2380	0.2411	0.2535	0.2504	0.2597	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Brickwork	66.3700	20.1200	46.2500	0.2100	9.7125	110.0000	5087.5003	(29a)
Communal Wall	5.2700	2.0600	3.2100	0.2200	0.7062	110.0000	353.1000	(29a)
Stairwell Wall	19.7200		19.7200	0.2200	4.3384	110.0000	2169.1999	(29a)
Total net area of external elements Aum(A, m2)			91.3600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2673			(33)
Main dwelling								
Party Wall 1			32.1300	0.0000	0.0000	110.0000	3534.3001	(32)
Party Floor 1			91.2200			70.0000	6385.4000	(32d)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			200.3300			9.0000	1802.9700	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	22069.0704	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	241.9324	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.4700	0.0380	2.2599
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8900	0.3300	1.2837
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.8900	0.0160	0.5262
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.6548	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	47.9221	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.6451	20.1704	20.1704	19.4584	19.6957	18.5091	18.5091	18.2717	18.5091	19.4584	19.2211	19.9331	(38)
Heat transfer coeff	68.5672	68.0925	68.0925	67.3805	67.6178	66.4311	66.4311	66.1938	66.4311	67.3805	67.1432	67.8552	(39)
Average = Sum(39)m / 12 =												67.3014	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7517	0.7465	0.7465	0.7387	0.7413	0.7283	0.7283	0.7257	0.7283	0.7387	0.7361	0.7439	(40)
HLP (average)												0.7378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6421	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)
Average daily hot water use (litres/day)												128.5022	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108 (64)
Total per year (kWh/year) = Sum(64)m =												2479.3192 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)

Heat gains from water heating, kWh/month

	73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	28.3090	25.1438	20.4483	15.4807	11.5720	9.7696	10.5564	13.7216	18.4170	23.3847	27.2934	29.0958	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	360.1558	363.8931	354.4752	334.4258	309.1169	285.3301	269.4391	265.7018	275.1196	295.1691	320.4780	344.2648	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)

Water heating gains (Table 5)

	98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)

Total internal gains

	593.7455	591.7647	572.7336	536.9382	501.1187	468.6287	449.2861	452.2159	470.4349	503.1091	542.6589	577.2632	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5000	12.7650	0.3300	0.0000	0.7700	21.0834	(74)
North	5.4500	12.7650	0.3300	0.0000	0.7700	17.6776	(74)
West	8.1700	23.8018	0.3300	0.0000	0.7700	49.4124	(80)

Solar gains	88.1734	149.7604	249.2001	386.0634	481.8636	532.9981	497.7762	422.2696	313.8675	191.3188	107.9222	73.2845	(83)
Total gains	681.9189	741.5251	821.9337	923.0016	982.9823	1001.6268	947.0624	874.4854	784.3023	694.4279	650.5810	650.5477	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	89.4057	90.0290	90.0290	90.9803	90.6610	92.2805	92.2805	92.6113	92.2805	90.9803	91.3019	90.3439	
alpha	6.9604	7.0019	7.0019	7.0654	7.0441	7.1520	7.1520	7.1741	7.1520	7.0654	7.0868	7.0229	
util living area	0.9854	0.9715	0.9207	0.7677	0.5531	0.3448	0.2315	0.2574	0.5062	0.8376	0.9650	0.9884	(86)
MIT	20.4550	20.5807	20.7792	20.9487	20.9948	20.9999	21.0000	21.0000	20.9980	20.9236	20.6797	20.4312	(87)
Th 2	20.2954	20.3000	20.3000	20.3068	20.3045	20.3159	20.3159	20.3182	20.3159	20.3068	20.3091	20.3022	(88)
util rest of house	0.9813	0.9639	0.9021	0.7303	0.5072	0.2995	0.1835	0.2058	0.4494	0.7976	0.9544	0.9851	(89)
MIT 2	19.6722	19.8324	20.0708	20.2613	20.3010	20.3159	20.3159	20.3182	20.3149	20.2405	19.9643	19.6481	(90)
Living area fraction									fLA = Living area / (4) =			0.3766	(91)
MIT	19.9670	20.1142	20.3375	20.5202	20.5622	20.5734	20.5735	20.5750	20.5721	20.4977	20.2337	19.9430	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9670	20.1142	20.3375	20.5202	20.5622	20.5734	20.5735	20.5750	20.5721	20.4977	20.2337	19.9430	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9790	0.9616	0.9032	0.7422	0.5243	0.3165	0.2016	0.2252	0.4708	0.8092	0.9530	0.9830	(94)
Useful gains	667.5850	713.0463	742.3650	685.0435	515.3962	317.0470	190.8903	196.9200	369.2488	561.9504	620.0189	639.5198	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1019.3875	981.4985	880.9500	715.5909	518.1038	317.1050	190.8919	196.9234	370.1603	606.2711	821.4098	1007.1710	(97)
Space heating kWh	261.7410	180.3999	103.1073	21.9942	2.0144	0.0000	0.0000	0.0000	0.0000	32.9746	145.0015	273.5325	(98a)
Space heating requirement - total per year (kWh/year)												1020.7653	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	261.7410	180.3999	103.1073	21.9942	2.0144	0.0000	0.0000	0.0000	0.0000	32.9746	145.0015	273.5325	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1020.7653	
Space heating per m2											(98c) / (4) =	11.1901	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	261.7410	180.3999	103.1073	21.9942	2.0144	0.0000	0.0000	0.0000	0.0000	32.9746	145.0015	273.5325	(98)

Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	261.7410	180.3999	103.1073	21.9942	2.0144	0.0000	0.0000	0.0000	0.0000	32.9746	145.0015	273.5325	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601	(231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1020.7653	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	685.5292	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	166.7239	(230a)
Total electricity for the above, kWh/year	166.7239	(231)
Electricity for lighting (calculated in Appendix L)	199.9782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2072.9967	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1020.7653	27.6700	282.4458	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	27.6700	189.6859	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	166.7239	27.6700	46.1325	(249)
Energy for lighting	199.9782	27.6700	55.3340	(250)
Additional standing charges			0.0000	(251)
Total energy cost			573.5982	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1020.7653	0.1584	161.6798	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			258.4624	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			310.4521	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1020.7653	1.5863	1619.2570	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	1.5220	1043.4058	(278)
Space and water heating			2662.6628	(279)
Pumps, fans and electric keep-hot	166.7239	1.5128	252.2200	(281)
Energy for lighting	199.9782	1.5338	306.7333	(282)
Total Primary energy kWh/year			3221.6161	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 83
Current environmental impact rating: A 96

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 83
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£574	£574	£0
Space heating	£329	£329	£0
Water heating	£190	£190	£0
Lighting	£55	£55	£0
Total cost of fuels	£574	£574	£0
Total cost of uses	£574	£574	£0
Delivered energy	23 kWh/m²	23 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	35 kWh/m²	35 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	232.6110	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9100 (17)
Infiltration rate		0.1455 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1237 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1577	0.1546	0.1515	0.1360	0.1330	0.1175	0.1175	0.1144	0.1237	0.1330	0.1391	0.1453	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2937	0.2906	0.2875	0.2720	0.2690	0.2535	0.2535	0.2504	0.2597	0.2690	0.2751	0.2813	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Brickwork	66.3700	20.1200	46.2500	0.2100	9.7125	110.0000	5087.5003	(29a)
Communal Wall	5.2700	2.0600	3.2100	0.2200	0.7062	110.0000	353.1000	(29a)
Stairwell Wall	19.7200		19.7200	0.2200	4.3384	110.0000	2169.1999	(29a)
Total net area of external elements Aum(A, m2)			91.3600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2673			(33)
Main dwelling								
Party Wall 1			32.1300	0.0000	0.0000	110.0000	3534.3001	(32)
Party Floor 1			91.2200			70.0000	6385.4000	(32d)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			200.3300			9.0000	1802.9700	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22069.0704 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 241.9324 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.4700	0.0380	2.2599
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8900	0.3300	1.2837
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.8900	0.0160	0.5262
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6548 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.9221 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.5438	22.3064	22.0691	20.8824	20.6451	19.4584	19.4584	19.2211	19.9331	20.6451	21.1198	21.5944	(38)
Heat transfer coeff	70.4659	70.2285	69.9912	68.8045	68.5672	67.3805	67.3805	67.1432	67.8552	68.5672	69.0419	69.5165	(39)
Average = Sum(39)m / 12 =												68.7452	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7725	0.7699	0.7673	0.7543	0.7517	0.7387	0.7387	0.7361	0.7439	0.7517	0.7569	0.7621	(40)
HLP (average)												0.7536	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6421 (42)

Hot water usage for mixer showers

68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873	(42c)

Average daily hot water use (litres/day) 128.5022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)										Total = Sum(45)m =		2134.3942	
Distribution loss (46)m = 0.15 x (45)m	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
									Total per year (kWh/year) = Sum(64)m =			2479.3192	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
28.3090 25.1438 20.4483 15.4807 11.5720 9.7696 10.5564 13.7216 18.4170 23.3847 27.2934 29.0958 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
360.1558 363.8931 354.4752 334.4258 309.1169 285.3301 269.4391 265.7018 275.1196 295.1691 320.4780 344.2648 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
53.4944 53.4944 53.4944 53.4944 53.4944 53.4944 53.4944 53.4944 53.4944 53.4944 53.4944 53.4944 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-105.6821 -105.6821 -105.6821 -105.6821 -105.6821 -105.6821 -105.6821 -105.6821 -105.6821 -105.6821 -105.6821 -105.6821 (71)
Water heating gains (Table 5)
98.9453 96.3924 91.4746 80.6963 74.0944 67.1936 62.9552 66.4571 70.5627 78.2198 88.5521 97.5672 (72)
Total internal gains
593.7455 591.7647 572.7336 536.9382 501.1187 468.6287 449.2861 452.2159 470.4349 503.1091 542.6589 577.2632 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5000	10.6334	0.3300	0.0000	0.7700	17.5626	(74)
North	5.4500	10.6334	0.3300	0.0000	0.7700	14.7256	(74)
West	8.1700	19.6403	0.3300	0.0000	0.7700	40.7731	(80)

Solar gains 73.0614 141.4654 236.2058 359.9908 461.6540 483.2145 455.5678 376.4480 278.8360 168.0941 90.6710 60.4469 (83)
Total gains 666.8069 733.2301 808.9394 896.9290 962.7727 951.8432 904.8539 828.6639 749.2708 671.2032 633.3299 637.7101 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.9967	87.2907	87.5867	89.0973	89.4057	90.9803	90.9803	91.3019	90.3439	89.4057	88.7910	88.1847	
alpha	6.7998	6.8194	6.8391	6.9398	6.9604	7.0654	7.0654	7.0868	7.0229	6.9604	6.9194	6.8790	
util living area	0.9908	0.9810	0.9482	0.8392	0.6491	0.4521	0.3276	0.3725	0.6160	0.8992	0.9801	0.9929	(86)
MIT	20.3304	20.4660	20.6781	20.8961	20.9834	20.9989	20.9999	20.9998	20.9914	20.8573	20.5588	20.3048	(87)
Th 2	20.2772	20.2795	20.2818	20.2931	20.2954	20.3068	20.3068	20.3091	20.3022	20.2954	20.2909	20.2863	(88)
util rest of house	0.9882	0.9760	0.9353	0.8081	0.6042	0.4036	0.2760	0.3167	0.5574	0.8701	0.9739	0.9909	(89)
MIT 2	19.4999	19.6724	19.9351	20.1945	20.2826	20.3062	20.3068	20.3090	20.2968	20.1604	19.7999	19.4749	(90)
Living area fraction										fLA = Living area / (4) =		0.3766	(91)
MIT	19.8126	19.9712	20.2149	20.4586	20.5465	20.5670	20.5678	20.5691	20.5584	20.4228	20.0857	19.7874	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8126	19.9712	20.2149	20.4586	20.5465	20.5670	20.5678	20.5691	20.5584	20.4228	20.0857	19.7874	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9734	0.9339	0.8158	0.6204	0.4218	0.2954	0.3377	0.5792	0.8759	0.9717	0.9891	(94)
Useful gains	657.5880	713.6907	755.4894	731.7030	597.3402	401.5328	267.3168	279.8431	433.9680	587.8943	615.4020	630.7617	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1093.1110	1058.4297	959.9220	795.2872	606.5802	402.0600	267.3510	279.9278	438.2330	673.5233	896.5571	1083.5800	(97)
Space heating kWh	324.0291	231.6646	152.0979	45.7806	6.8746	0.0000	0.0000	0.0000	0.0000	63.7080	202.4316	336.8968	(98a)
Space heating requirement - total per year (kWh/year)												1363.4831	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	324.0291	231.6646	152.0979	45.7806	6.8746	0.0000	0.0000	0.0000	0.0000	63.7080	202.4316	336.8968	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1363.4831	
Space heating per m2											(98c) / (4) =	14.9472	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	324.0291	231.6646	152.0979	45.7806	6.8746	0.0000	0.0000	0.0000	0.0000	63.7080	202.4316	336.8968	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	324.0291	231.6646	152.0979	45.7806	6.8746	0.0000	0.0000	0.0000	0.0000	63.7080	202.4316	336.8968	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)

Fuel for water heating, kWh/month

	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601 (231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1363.4831	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	685.5292	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	166.7239	(230a)
Total electricity for the above, kWh/year	166.7239	(231)
Electricity for lighting (calculated in Appendix L)	199.9782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2415.7145	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1363.4831	16.4900	224.8384	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	16.4900	113.0438	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	166.7239	16.4900	27.4928	(249)
Energy for lighting	199.9782	16.4900	32.9764	(250)
Additional standing charges			0.0000	(251)
Total energy cost			398.3513	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0528	(257)
SAP value		82.9348	
SAP rating (Section 12)		83	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1363.4831	0.1575	214.7538	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			311.5364	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			363.5261	(272)
CO2 emissions per m2			3.9900	(273)
EI value			96.4240	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	91.2200	(1b)	x 2.5500	(2b) =	232.6110	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		232.6110	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9100 (17)
Infiltration rate		0.1455 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1237 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1330	0.1268	0.1268	0.1175	0.1206	0.1051	0.1051	0.1020	0.1051	0.1175	0.1144	0.1237	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2690	0.2628	0.2628	0.2535	0.2566	0.2411	0.2411	0.2380	0.2411	0.2535	0.2504	0.2597	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.6200	1.1450	15.5954			(27)
Brickwork	66.3700	20.1200	46.2500	0.2100	9.7125	110.0000	5087.5003	(29a)
Communal Wall	5.2700	2.0600	3.2100	0.2200	0.7062	110.0000	353.1000	(29a)
Stairwell Wall	19.7200		19.7200	0.2200	4.3384	110.0000	2169.1999	(29a)
Total net area of external elements Aum(A, m2)			91.3600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2673			(33)
Main dwelling								
Party Wall 1			32.1300	0.0000	0.0000	110.0000	3534.3001	(32)
Party Floor 1			91.2200			70.0000	6385.4000	(32d)
Party Ceiling 1			91.2200			30.0000	2736.6000	(32b)
Internal Wall 1			200.3300			9.0000	1802.9700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 22069.0704 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	241.9324 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.4700	0.0380	2.2599
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.3200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8900	0.3300	1.2837
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.8900	0.0160	0.5262
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.6548 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 47.9221 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.6451	20.1704	20.1704	19.4584	19.6957	18.5091	18.5091	18.2717	18.5091	19.4584	19.2211	19.9331	(38)
Heat transfer coeff	68.5672	68.0925	68.0925	67.3805	67.6178	66.4311	66.4311	66.1938	66.4311	67.3805	67.1432	67.8552	(39)
Average = Sum(39)m / 12 =												67.3014	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7517	0.7465	0.7465	0.7387	0.7413	0.7283	0.7283	0.7257	0.7283	0.7387	0.7361	0.7439	(40)
HLP (average)												0.7378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6421 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.5183	67.4886	65.9881	63.1173	60.9986	58.6359	57.2930	58.7821	60.4145	62.9513	65.8838	68.2558	(42a)

Hot water usage for baths

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
29.5883	29.1489	28.5301	27.3891	26.5348	25.5875	25.0758	25.6902	26.3593	27.3730	28.5374	29.4883	(42b)

Hot water usage for other uses

	41.6873	40.1714	38.6555	37.1396	35.6237	34.1078	34.1078	35.6237	37.1396	38.6555	40.1714	41.6873 (42c)
Average daily hot water use (litres/day)												128.5022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.7939	136.8089	133.1737	127.6460	123.1571	118.3312	116.4765	120.0960	123.9133	128.9797	134.5926	139.4314	(44)
Energy conte	221.3994	194.8140	204.6830	174.7410	165.7931	145.5020	140.8683	148.7040	152.7975	175.0242	191.7518	218.3158	(45)
Energy content (annual)											Total = Sum(45)m =	2134.3942	
Distribution loss (46)m = 0.15 x (45)m													
	33.2099	29.2221	30.7025	26.2111	24.8690	21.8253	21.1302	22.3056	22.9196	26.2536	28.7628	32.7474	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
											Total per year (kWh/year) = Sum(64)m =	2479.3192	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	73.6153	64.7757	68.0571	58.1014	55.1262	48.3794	46.8387	49.4441	50.8052	58.1956	63.7575	72.5900	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	158.5232	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.3090	25.1438	20.4483	15.4807	11.5720	9.7696	10.5564	13.7216	18.4170	23.3847	27.2934	29.0958	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	360.1558	363.8931	354.4752	334.4258	309.1169	285.3301	269.4391	265.7018	275.1196	295.1691	320.4780	344.2648	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	53.4944	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	-105.6821	(71)
Water heating gains (Table 5)													
	98.9453	96.3924	91.4746	80.6963	74.0944	67.1936	62.9552	66.4571	70.5627	78.2198	88.5521	97.5672	(72)
Total internal gains													
	593.7455	591.7647	572.7336	536.9382	501.1187	468.6287	449.2861	452.2159	470.4349	503.1091	542.6589	577.2632	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5000	12.7650	0.3300	0.0000	0.7700	21.0834	(74)
North	5.4500	12.7650	0.3300	0.0000	0.7700	17.6776	(74)
West	8.1700	23.8018	0.3300	0.0000	0.7700	49.4124	(80)

Solar gains	88.1734	149.7604	249.2001	386.0634	481.8636	532.9981	497.7762	422.2696	313.8675	191.3188	107.9222	73.2845	(83)
Total gains	681.9189	741.5251	821.9337	923.0016	982.9823	1001.6268	947.0624	874.4854	784.3023	694.4279	650.5810	650.5477	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	89.4057	90.0290	90.0290	90.9803	90.6610	92.2805	92.2805	92.6113	92.2805	90.9803	91.3019	90.3439	
alpha	6.9604	7.0019	7.0019	7.0654	7.0441	7.1520	7.1520	7.1741	7.1520	7.0654	7.0868	7.0229	
util living area													
	0.9854	0.9715	0.9207	0.7677	0.5531	0.3448	0.2315	0.2574	0.5062	0.8376	0.9650	0.9884	(86)
MIT	20.4550	20.5807	20.7792	20.9487	20.9948	20.9999	21.0000	21.0000	20.9980	20.9236	20.6797	20.4312	(87)
Th 2	20.2954	20.3000	20.3000	20.3068	20.3045	20.3159	20.3159	20.3182	20.3159	20.3068	20.3091	20.3022	(88)
util rest of house													
	0.9813	0.9639	0.9021	0.7303	0.5072	0.2995	0.1835	0.2058	0.4494	0.7976	0.9544	0.9851	(89)
MIT 2	19.6722	19.8324	20.0708	20.2613	20.3010	20.3159	20.3159	20.3182	20.3149	20.2405	19.9643	19.6481	(90)
Living area fraction											fLA = Living area / (4) =	0.3766	(91)
MIT	19.9670	20.1142	20.3375	20.5202	20.5622	20.5734	20.5735	20.5750	20.5721	20.4977	20.2337	19.9430	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9670	20.1142	20.3375	20.5202	20.5622	20.5734	20.5735	20.5750	20.5721	20.4977	20.2337	19.9430	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9790	0.9616	0.9032	0.7422	0.5243	0.3165	0.2016	0.2252	0.4708	0.8092	0.9530	0.9830	(94)
Useful gains	667.5850	713.0463	742.3650	685.0435	515.3962	317.0470	190.8903	196.9200	369.2488	561.9504	620.0189	639.5198	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1019.3875	981.4985	880.9500	715.5909	518.1038	317.1050	190.8919	196.9234	370.1603	606.2711	821.4098	1007.1710	(97)
Space heating kWh													

	261.7410	180.3999	103.1073	21.9942	2.0144	0.0000	0.0000	0.0000	0.0000	32.9746	145.0015	273.5325 (98a)
Space heating requirement - total per year (kWh/year)												1020.7653
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	261.7410	180.3999	103.1073	21.9942	2.0144	0.0000	0.0000	0.0000	0.0000	32.9746	145.0015	273.5325 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1020.7653
Space heating per m2											(98c) / (4) =	11.1901 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	261.7410	180.3999	103.1073	21.9942	2.0144	0.0000	0.0000	0.0000	0.0000	32.9746	145.0015	273.5325	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	261.7410	180.3999	103.1073	21.9942	2.0144	0.0000	0.0000	0.0000	0.0000	32.9746	145.0015	273.5325	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	250.6944	221.2740	233.9780	203.0910	195.0881	173.8520	170.1633	177.9990	181.1475	204.3192	220.1018	247.6108	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	69.3167	61.1820	64.6947	56.1544	53.9417	48.0699	47.0500	49.2165	50.0871	56.4941	60.8579	68.4641	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.1601	12.7898	14.1601	13.7033	14.1601	13.7033	14.1601	14.1601	13.7033	14.1601	13.7033	14.1601	(231)
Lighting	24.7787	19.8784	17.8983	13.1131	10.1289	8.2754	9.2399	12.0104	15.6003	20.4685	23.1191	25.4674	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1020.7653 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	361.6650
Water heating fuel used	685.5292 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)	
mechanical ventilation fans (SFP = 0.5875)	166.7239 (230a)
Total electricity for the above, kWh/year	166.7239 (231)
Electricity for lighting (calculated in Appendix L)	199.9782 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2072.9967 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1020.7653	27.6700	282.4458	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	27.6700	189.6859	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	166.7239	27.6700	46.1325	(249)
Energy for lighting	199.9782	27.6700	55.3340	(250)
Additional standing charges			0.0000	(251)
Total energy cost			573.5982	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1020.7653	0.1584	161.6798	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	685.5292	0.1412	96.7826	(264)
Space and water heating			258.4624	(265)
Pumps, fans and electric keep-hot	166.7239	0.1387	23.1267	(267)
Energy for lighting	199.9782	0.1443	28.8630	(268)
Total CO2, kg/year			310.4521	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1020.7653	1.5863	1619.2570	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	685.5292	1.5220	1043.4058	(278)
Space and water heating			2662.6628	(279)
Pumps, fans and electric keep-hot	166.7239	1.5128	252.2200	(281)
Energy for lighting	199.9782	1.5338	306.7333	(282)
Total Primary energy kWh/year			3221.6161	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-17	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-17
Plot Address	Flat 12, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	78 C	**DER**	6.05	**TER**	14.87
Environmental	95 A	**% DER < TER**			59.31
CO_2 Emissions (t/year)	0.33	**DFEE**	42.47	**TFEE**	42.00
Compliance Check	See BREL	**% DFEE < TFEE**			-1.13
% DPER < TPER	21.09	**DPER**	62.30	**TPER**	78.96

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	224.90	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	27.17 m	66.96 m²	2.40 m

8.0 Living Area	24.14	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	60.41	39.02	0.00	None	21.39	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	14.33	14.33	0.50	Stairwell Access Corridor 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	27.97	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	136.07

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	66.95	66.95	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors

Summary for Input Data

elmhurst energy

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Exposed Floor	Exposed Floor - Solid	Lowest occupied	Other	0.14	Garage Single 1 Inside	0.70	0.00	5.71

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	61.24

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window -Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Brickwork	South	2.06	
Patio Door	Window -Red	Brickwork	East	6.50	
East	Window -Red	Brickwork	East	4.91	
North	Window	Brickwork	North	7.92	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	16.83	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	11.00	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	8.25	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	2.75	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	10.36	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	9.17	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	32.44	0.02	0.02	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	3.58	0.33	0.33	Abbey Calculated	No
E10 Eaves (insulation at ceiling level)	Independently assessed	16.32	0.06	0.06	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	9.22	0.10	0.10	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	7.95	0.03	0.03	RCD	No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	10.36	0.10	0.10	RCD	No
E20 Exposed floor (normal)	Independently assessed	6.77	0.12	0.12	-	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value	0.06	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	8
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No

Summary for Input Data

Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-17	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-17
Plot Address	Flat 12, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	78 C	**DER**	6.05	**TER**	14.87
Environmental	95 A	**% DER < TER**			59.31
CO_2 Emissions (t/year)	0.33	**DFEE**	42.47	**TFEE**	42.00
Compliance Check	See BREL	**% DFEE < TFEE**			-1.13
% DPER < TPER	21.09	**DPER**	62.30	**TPER**	78.96

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.4000 (2b)	=	160.7040	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.7040	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			7.9200	1.1450	9.0687			(27)
Window -Red			11.4100	1.2357	14.0998			(27)
Exposed Floor			5.7100	0.1275	0.7281	0.0000	0.0000	(28b)
Brickwork	60.4100	21.3900	39.0200	0.2100	8.1942	110.0000	4292.2000	(29a)
Communal Wall	14.3300		14.3300	0.2200	3.1526	110.0000	1576.3000	(29a)
Cold Roof	66.9500		66.9500	0.0900	6.0255	9.0000	602.5500	(30)
Total net area of external elements Aum(A, m2)			147.4000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.7409			(33)
Main dwelling								
Party Wall 1			27.9700	0.0000	0.0000	110.0000	3076.6999	(32)
Party Floor 1			61.2400			70.0000	4286.8000	(32d)
Internal Wall 1			136.0700			9.0000	1224.6301	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15059.1800	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 224.8982 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.8300	0.0380	0.6395
E16 Corner (normal)	11.0000	0.0540	0.5940
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0970	-0.8003
E18 Party wall between dwellings	2.7500	0.0380	0.1045
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.3600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.1700	0.0500	0.4585
E4 Jamb	32.4400	0.0160	0.5190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.5800	0.3300	1.1814
E10 Eaves (insulation at ceiling level)	16.3200	0.0630	1.0282
E12 Gable (insulation at ceiling level)	9.2200	0.0980	0.9036
E25 Staggered party wall between dwellings	7.9500	0.0310	0.2465
P4 Party wall - Roof (insulation at ceiling level)	10.3600	0.1010	1.0464
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4777 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 53.2185 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.8335	15.6644	15.4954	14.6502	14.4811	13.6359	13.6359	13.4669	13.9740	14.4811	14.8192	15.1573	(38)
Heat transfer coeff	69.0520	68.8829	68.7139	67.8687	67.6997	66.8545	66.8545	66.6854	67.1925	67.6997	68.0377	68.3758	(39)
Average = Sum(39)m / 12 =												67.8264	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0312	1.0287	1.0262	1.0136	1.0110	0.9984	0.9984	0.9959	1.0035	1.0110	1.0161	1.0211	(40)
HLP (average)												1.0129	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)
Hot water usage for baths	26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)
Hot water usage for other uses	36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)
Average daily hot water use (litres/day)												113.6581	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
										Total per year (kWh/year) = Sum(64)m =		2232.7623	(64)
12Total per year (kWh/year)												2233	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8839	106.1572	95.8839	99.0800	95.8839	99.0800	95.8839	95.8839	99.0800	95.8839	99.0800	95.8839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains	429.0515	439.0397	419.4459	402.5261	380.1320	364.6692	349.3364	350.4609	362.2593	376.4184	402.1120	419.4449	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
North					7.9200	10.6334		0.3300		0.0000	0.7700	21.3994	(74)
East					11.4100	19.6403		0.3100		0.0000	0.7700	53.4916	(76)
Solar gains	74.8910	145.5362	241.8198	362.9517	458.3789	476.2771	450.4713	377.0876	283.9762	172.8458	93.0966	61.8285	(83)
Total gains	503.9425	584.5759	661.2657	765.4778	838.5108	840.9463	799.8077	727.5485	646.2355	549.2642	495.2086	481.2733	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.5791	60.7277	60.8771	61.6353	61.7892	62.5703	62.5703	62.7289	62.2555	61.7892	61.4821	61.1781	
alpha	5.0386	5.0485	5.0585	5.1090	5.1193	5.1714	5.1714	5.1819	5.1504	5.1193	5.0988	5.0785	
util living area	0.9913	0.9809	0.9539	0.8642	0.6987	0.5011	0.3665	0.4188	0.6753	0.9210	0.9821	0.9930	(86)
MIT	19.8360	20.0458	20.3483	20.7146	20.9218	20.9884	20.9981	20.9964	20.9513	20.6456	20.1794	19.8030	(87)
Th 2	20.0574	20.0595	20.0616	20.0720	20.0741	20.0846	20.0846	20.0868	20.0804	20.0741	20.0699	20.0658	(88)
util rest of house	0.9888	0.9757	0.9415	0.8323	0.6436	0.4326	0.2909	0.3371	0.6003	0.8940	0.9762	0.9910	(89)
MIT 2	18.7097	18.9762	19.3540	19.7943	20.0116	20.0781	20.0840	20.0854	20.0485	19.7292	19.1554	18.6738	(90)
Living area fraction									fLA = Living area / (4) =			0.3605	(91)
MIT	19.1157	19.3618	19.7125	20.1261	20.3397	20.4063	20.4135	20.4138	20.3740	20.0596	19.5245	19.0809	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1157	19.3618	19.7125	20.1261	20.3397	20.4063	20.4135	20.4138	20.3740	20.0596	19.5245	19.0809	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9855	0.9708	0.9360	0.8343	0.6600	0.4570	0.3182	0.3666	0.6253	0.8935	0.9718	0.9881	(94)
Useful gains	496.6251	567.5183	618.9129	638.6703	553.4479	384.3061	254.4824	266.7100	404.0620	490.7876	481.2512	475.5509	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1023.0560	996.1697	907.8813	761.8996	584.9077	388.1751	254.9528	267.6626	421.5628	640.4106	845.3381	1017.4914	(97)
Space heating kWh	391.6646	288.0538	214.9925	88.7251	23.4060	0.0000	0.0000	0.0000	0.0000	111.3195	262.1425	403.2037	(98a)
Space heating requirement - total per year (kWh/year)												1783.5077	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	391.6646	288.0538	214.9925	88.7251	23.4060	0.0000	0.0000	0.0000	0.0000	111.3195	262.1425	403.2037	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1783.5077	
Space heating per m2											(98c) / (4) =	26.6354	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	391.6646	288.0538	214.9925	88.7251	23.4060	0.0000	0.0000	0.0000	0.0000	111.3195	262.1425	403.2037	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	391.6646	288.0538	214.9925	88.7251	23.4060	0.0000	0.0000	0.0000	0.0000	111.3195	262.1425	403.2037	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.7828	8.8361	9.7828	9.4672	9.7828	9.4672	9.7828	9.7828	9.4672	9.7828	9.4672	9.7828	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	1783.5077	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	115.1846	(230a)
Total electricity for the above, kWh/year	115.1846	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2673.5506	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1783.5077	0.1565	279.0462	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			366.1771	(265)
Pumps, fans and electric keep-hot	115.1846	0.1387	15.9775	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			404.8870	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.0500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1783.5077	1.5792	2816.5601	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	1.5219	939.5420	(278)
Space and water heating			3756.1021	(279)
Pumps, fans and electric keep-hot	115.1846	1.5128	174.2513	(281)
Energy for lighting	157.5018	1.5338	241.5815	(282)
Total Primary energy kWh/year			4171.9349	(286)
Dwelling Primary energy Rate (DPER)			62.3000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.4000	(2b) =	160.7040	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.7040	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1245	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3745	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3183	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4058	0.3979	0.3899	0.3501	0.3422	0.3024	0.3024	0.2944	0.3183	0.3422	0.3581	0.3740 (22b)
Effective ac	0.5823	0.5791	0.5760	0.5613	0.5585	0.5457	0.5457	0.5433	0.5507	0.5585	0.5641	0.5699 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			14.6800	1.1450	16.8092			(27)
Exposed Floor			5.7100	0.1300	0.7423			(28b)
Brickwork	60.4100	16.7400	43.6700	0.1800	7.8606			(29a)
Communal Wall	14.3300		14.3300	0.1800	2.5794			(29a)
Cold Roof	66.9500		66.9500	0.1100	7.3645			(30)
Total net area of external elements Aum(A, m2)			147.4000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.4160			(33)
Main dwelling								
Party Wall 1			27.9700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 224.8982 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.8300	0.0700	1.1781
E16 Corner (normal)	11.0000	0.0900	0.9900
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0900	-0.7425
E18 Party wall between dwellings	2.7500	0.0600	0.1650
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.3600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.1700	0.0500	0.4585
E4 Jamb	32.4400	0.0500	1.6220
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.5800	0.0200	0.0716
E10 Eaves (insulation at ceiling level)	16.3200	0.0600	0.9792
E12 Gable (insulation at ceiling level)	9.2200	0.0600	0.5532
E25 Staggered party wall between dwellings	7.9500	0.0600	0.4770
P4 Party wall - Roof (insulation at ceiling level)	10.3600	0.1200	1.2432
E20 Exposed floor (normal)	6.7700	0.3200	2.1664
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.0817 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 50.4977 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.8829	30.7134	30.5472	29.7665	29.6204	28.9405	28.9405	28.8146	29.2024	29.6204	29.9159	30.2248	(38)
Heat transfer coeff	81.3806	81.2110	81.0448	80.2641	80.1181	79.4381	79.4381	79.3122	79.7000	80.1181	80.4136	80.7225	(39)
Average = Sum(39)m / 12 =												80.2634	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2154	1.2128	1.2103	1.1987	1.1965	1.1864	1.1864	1.1845	1.1903	1.1965	1.2009	1.2055	(40)
HLP (average)												1.1987	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)											Total = Sum(45)m =	1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	242.4186	214.3957	227.6343	199.6478	193.2368	173.7866	171.1909	178.1211	180.2384	201.4005	214.6928	239.6911	(62)
WWHRS	-27.7063	-24.5036	-25.6588	-21.2465	-19.8010	-16.9438	-15.8821	-16.8891	-17.5307	-20.6668	-23.4130	-27.1932	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
										Total per year (kWh/year) = Sum(64)m =		2179.0197	(64)
12Total per year (kWh/year)												2179	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.3873	90.9616	97.4715	87.4633	86.0344	78.8645	78.7041	81.0084	81.0097	88.7488	92.4658	101.4804	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	95.9281	106.2061	95.9281	99.1257	95.9281	99.1257	95.9281	95.9281	99.1257	95.9281	99.1257	95.9281	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	137.6173	135.3596	131.0101	121.4769	115.6376	109.5340	105.7851	108.8822	112.5135	119.2860	128.4247	136.3984	(72)
Total internal gains													
	482.1978	492.1906	472.5921	455.6738	433.2782	414.8169	399.4826	400.6071	412.4070	429.5646	455.2597	472.5911	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.0100	10.6334	0.6300	0.7000	0.7700	19.5307	(74)
East	8.6700	19.6403	0.6300	0.7000	0.7700	52.0401	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	71.5708	139.1257	231.0755	346.3848	436.8907	453.6649	429.2024	359.6790	271.2418	165.2256	88.9816	59.0770	(83)
Total gains	553.7686	631.3163	703.6676	802.0586	870.1689	868.4818	828.6850	760.2861	683.6488	594.7902	544.2412	531.6681	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.4017	51.5091	51.6147	52.1167	52.2118	52.6587	52.6587	52.7423	52.4856	52.2118	52.0199	51.8208	
alpha	4.4268	4.4339	4.4410	4.4744	4.4808	4.5106	4.5106	4.5162	4.4990	4.4808	4.4680	4.4547	
util living area	0.9888	0.9791	0.9562	0.8860	0.7491	0.5625	0.4168	0.4706	0.7197	0.9250	0.9790	0.9906	(86)
MIT	19.6069	19.8159	20.1368	20.5513	20.8393	20.9657	20.9928	20.9879	20.9001	20.5123	19.9930	19.5732	(87)
Th 2	19.9077	19.9098	19.9117	19.9210	19.9228	19.9309	19.9309	19.9324	19.9278	19.9228	19.9193	19.9156	(88)
util rest of house	0.9855	0.9732	0.9436	0.8550	0.6895	0.4776	0.3180	0.3659	0.6360	0.8970	0.9719	0.9878	(89)
MIT 2	18.3119	18.5773	18.9790	19.4815	19.7928	19.9117	19.9286	19.9281	19.8620	19.4510	18.8106	18.2748	(90)
Living area fraction									fLA = Living area / (4) =			0.3605	(91)
MIT	18.7788	19.0238	19.3964	19.8672	20.1701	20.2917	20.3123	20.3102	20.2363	19.8336	19.2368	18.7429	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7788	19.0238	19.3964	19.8672	20.1701	20.2917	20.3123	20.3102	20.2363	19.8336	19.2368	18.7429	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9669	0.9362	0.8532	0.7041	0.5071	0.3537	0.4037	0.6618	0.8943	0.9661	0.9837	(94)
Useful gains	543.2187	610.3979	658.7784	684.3174	612.7100	440.4072	293.0930	306.9016	452.4075	531.9027	525.7706	523.0169	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1178.2917	1147.0109	1045.1875	880.2724	678.6066	452.1380	294.8965	310.1245	489.0617	739.7798	975.9668	1173.9386	(97)
Space heating kWh	472.4943	360.6040	287.4883	141.0876	49.0271	0.0000	0.0000	0.0000	0.0000	154.6606	324.1412	484.2858	(98a)
Space heating requirement - total per year (kWh/year)												2273.7889	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	472.4943	360.6040	287.4883	141.0876	49.0271	0.0000	0.0000	0.0000	0.0000	154.6606	324.1412	484.2858	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2273.7889	
Space heating per m2											(98c) / (4) =	33.9574	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	472.4943	360.6040	287.4883	141.0876	49.0271	0.0000	0.0000	0.0000	0.0000	154.6606	324.1412	484.2858	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	511.9115	390.6869	311.4717	152.8576	53.1171	0.0000	0.0000	0.0000	0.0000	167.5629	351.1823	524.6866	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7774	85.4747	84.8511	83.5390	81.6231	79.8000	79.8000	79.8000	79.8000	83.7124	85.2326	85.8473	(217)
Fuel for water heating, kWh/month	250.3134	222.1617	238.0352	213.5546	212.4837	196.5449	194.6225	202.0451	203.8943	215.8984	224.4210	247.5302	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9320	15.9902	14.3974	10.5481	8.1477	6.6567	7.4326	9.6612	12.5489	16.4648	18.5970	20.4859	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.9732	-26.6464	-40.2581	-47.6577	-53.5008	-50.7180	-50.1042	-46.2523	-39.8278	-31.5153	-20.2200	-15.3904	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.5375	-14.0493	-28.4829	-43.6093	-58.4788	-59.0518	-58.3524	-49.0281	-35.4450	-20.3565	-8.8131	-5.1475	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2463.4765	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2621.5049	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	160.8623	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-827.4164	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4504.4273	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2463.4765	0.2100	517.3301	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2621.5049	0.2100	550.5160	(264)
Space and water heating			1067.8461	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.8623	0.1443	23.2174	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0642	0.1335	-58.7646	
PV Unit electricity exported	-387.3523	0.1253	-48.5504	
Total			-107.3150	(269)
Total CO2, kg/year			995.6778	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2463.4765	1.1300	2783.7285	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2621.5049	1.1300	2962.3005	(278)
Space and water heating			5746.0290	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.8623	1.5338	246.7360	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0642	1.4935	-657.2219	
PV Unit electricity exported	-387.3523	0.4601	-178.2030	
Total			-835.4249	(283)
Total Primary energy kWh/year			5287.4409	(286)
Target Primary Energy Rate (TPER)			78.9600	(287)

Full SAP Calculation Printout

Plot Reference	P-17	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-17
Plot Address	Flat 12, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	78 C	**DER**	6.05	**TER**	14.87
Environmental	95 A	**% DER < TER**			59.31
CO_2 Emissions (t/year)	0.33	**DFEE**	42.47	**TFEE**	42.00
Compliance Check	See BREL	**% DFEE < TFEE**			-1.13
% DPER < TPER	21.09	**DPER**	62.30	**TPER**	78.96

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.4000 (2b)	=	160.7040	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.7040	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1245	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2745	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2333	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2974	0.2916	0.2858	0.2566	0.2508	0.2216	0.2216	0.2158	0.2333	0.2508	0.2624	0.2741	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5442	0.5425	0.5408	0.5329	0.5314	0.5246	0.5246	0.5233	0.5272	0.5314	0.5344	0.5376	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			7.9200	1.1450	9.0687			(27)
Window -Red			11.4100	1.2357	14.0998			(27)
Exposed Floor			5.7100	0.1275	0.7281	0.0000	0.0000	(28b)
Brickwork	60.4100	21.3900	39.0200	0.2100	8.1942	110.0000	4292.2000	(29a)
Communal Wall	14.3300		14.3300	0.2200	3.1526	110.0000	1576.3000	(29a)
Cold Roof	66.9500		66.9500	0.0900	6.0255	9.0000	602.5500	(30)
Total net area of external elements Aum(A, m2)			147.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.7409			(33)
Main dwelling								
Party Wall 1			27.9700	0.0000	0.0000	110.0000	3076.6999	(32)
Party Floor 1			61.2400			70.0000	4286.8000	(32d)
Internal Wall 1			136.0700			9.0000	1224.6301	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15059.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		224.8982 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	16.8300	0.0380	0.6395
E16 Corner (normal)	11.0000	0.0540	0.5940
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0970	-0.8003
E18 Party wall between dwellings	2.7500	0.0380	0.1045
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.3600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.1700	0.0500	0.4585
E4 Jamb	32.4400	0.0160	0.5190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.5800	0.3300	1.1814
E10 Eaves (insulation at ceiling level)	16.3200	0.0630	1.0282
E12 Gable (insulation at ceiling level)	9.2200	0.0980	0.9036
E25 Staggered party wall between dwellings	7.9500	0.0310	0.2465
P4 Party wall - Roof (insulation at ceiling level)	10.3600	0.1010	1.0464
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4777 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.2185 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.8620	28.7709	28.6816	28.2623	28.1838	27.8185	27.8185	27.7509	27.9592	28.1838	28.3425	28.5085	(38)
Heat transfer coeff	82.0805	81.9895	81.9002	81.4808	81.4023	81.0370	81.0370	80.9694	81.1777	81.4023	81.5610	81.7270	(39)

Average = Sum(39)m / 12 = 81.4804

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2258	1.2245	1.2231	1.2169	1.2157	1.2102	1.2102	1.2092	1.2123	1.2157	1.2181	1.2205	(40)
HLP (average)												1.2169	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 57.7819 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.0397	61.3107	59.4229	57.0730	54.9768	52.7982	52.3454	54.2293	56.1616	58.3988	60.7695	62.9512	(44)
Energy conte	99.8395	87.3056	91.3308	78.1301	74.0093	64.9216	63.3072	67.1472	69.2529	79.2467	86.5774	98.5664	(45)

Energy content (annual) Total = Sum(45)m = 959.6345

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(64)

Total per year (kWh/year) = Sum(64)m = 815.6894 (64)

12Total per year (kWh/year) 816 (64)

Electric shower(s)

48.5348	43.2449	47.2218	45.0632	45.9088	43.7925	45.2523	45.9088	45.0632	47.2218	46.3339	48.5348	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 552.0809 (64a)

Heat gains from water heating, kWh/month

33.3496	29.3637	31.2132	27.8684	27.2042	24.7440	24.7658	25.7460	25.9820	28.6454	29.9812	33.0791	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8839	106.1572	95.8839	99.0800	95.8839	99.0800	95.8839	95.8839	99.0800	95.8839	99.0800	95.8839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	44.8247	43.6959	41.9533	38.7062	36.5647	34.3666	33.2874	34.6048	36.0862	38.5018	41.6405	44.4611	(72)
Total internal gains	386.3610	397.4781	380.4912	369.8575	351.1612	339.6038	326.9408	326.2855	335.9340	345.7363	365.4298	377.6096	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.9200	10.6334	0.3300	0.0000	0.7700	21.3994	(74)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)

Solar gains	74.8910	145.5362	241.8198	362.9517	458.3789	476.2771	450.4713	377.0876	283.9762	172.8458	93.0966	61.8285	(83)

Total gains	461.2520	543.0143	622.3110	732.8092	809.5400	815.8810	777.4121	703.3731	619.9102	518.5820	458.5264	439.4381	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.9634	51.0200	51.0757	51.3386	51.3880	51.6197	51.6197	51.6628	51.5302	51.3880	51.2880	51.1839	
alpha	4.3976	4.4013	4.4050	4.4226	4.4259	4.4413	4.4413	4.4442	4.4353	4.4259	4.4192	4.4123	
util living area													
	0.9945	0.9881	0.9715	0.9136	0.7874	0.6018	0.4508	0.5143	0.7724	0.9524	0.9890	0.9955	(86)
MIT	19.4374	19.6574	20.0007	20.4569	20.7946	20.9526	20.9894	20.9816	20.8603	20.3946	19.8329	19.3955	(87)
Th 2	19.8994	19.9005	19.9015	19.9065	19.9075	19.9118	19.9118	19.9126	19.9101	19.9075	19.9056	19.9036	(88)
util rest of house													
	0.9928	0.9845	0.9627	0.8875	0.7301	0.5126	0.3432	0.4000	0.6909	0.9324	0.9851	0.9942	(89)
MIT 2	18.4903	18.7090	19.0471	19.4836	19.7751	19.8908	19.9091	19.9074	19.8356	19.4369	18.8885	18.4518	(90)
Living area fraction										fLA = Living area / (4) =		0.3605	(91)
MIT	18.8318	19.0509	19.3909	19.8345	20.1427	20.2735	20.2986	20.2946	20.2051	19.7822	19.2290	18.7920	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8318	19.0509	19.3909	19.8345	20.1427	20.2735	20.2986	20.2946	20.2051	19.7822	19.2290	18.7920	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9905	0.9809	0.9576	0.8855	0.7434	0.5434	0.3821	0.4412	0.7150	0.9296	0.9818	0.9923	(94)
Useful gains	456.8902	532.6224	595.8957	648.9229	601.8344	443.3309	297.0366	310.3619	443.2605	482.0704	450.1713	436.0328	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1192.7744	1160.2244	1055.7640	890.9507	687.2524	459.7677	299.7235	315.3469	495.5947	747.4499	989.2510	1192.5628	(97)
Space heating kWh													
	547.4978	421.7486	342.1420	174.2600	63.5509	0.0000	0.0000	0.0000	0.0000	197.4424	388.1374	562.8584	(98a)
Space heating requirement - total per year (kWh/year)												2697.6374	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	547.4978	421.7486	342.1420	174.2600	63.5509	0.0000	0.0000	0.0000	0.0000	197.4424	388.1374	562.8584	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2697.6374	
Space heating per m2											(98c) / (4) =	40.2873	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	761.7482	599.6741	615.3674	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8834	0.9326	0.9020	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	672.9250	559.2315	555.0842	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	917.8210	874.7359	790.0539	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	176.3251	234.7352	174.8175	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	44.0813	58.6838	43.7044	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												146.4695	(107)
Energy for space heating												40.2873	(99)
Energy for space cooling												2.1874	(108)
Total												42.4747	(109)
Fabric Energy Efficiency (DFEE)												42.5	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		66.9600	(1b)	x 2.4000	(2b) =	160.7040	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		160.7040	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)

Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1245 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3745 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3183 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4058	0.3979	0.3899	0.3501	0.3422	0.3024	0.3024	0.2944	0.3183	0.3422	0.3581	0.3740	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)
Effective ac	0.5823 0.5791 0.5760 0.5613 0.5585 0.5457 0.5457 0.5433 0.5507 0.5585 0.5641 0.5699	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			14.6800	1.1450	16.8092			(27)
Exposed Floor			5.7100	0.1300	0.7423			(28b)
Brickwork	60.4100	16.7400	43.6700	0.1800	7.8606			(29a)
Communal Wall	14.3300		14.3300	0.1800	2.5794			(29a)
Cold Roof	66.9500		66.9500	0.1100	7.3645			(30)
Total net area of external elements Aum(A, m2)			147.4000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.4160			(33)
Main dwelling								
Party Wall 1			27.9700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		224.8982 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.8300	0.0700	1.1781
E16 Corner (normal)	11.0000	0.0900	0.9900
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0900	-0.7425
E18 Party wall between dwellings	2.7500	0.0600	0.1650
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.3600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.1700	0.0500	0.4585
E4 Jamb	32.4400	0.0500	1.6220
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.5800	0.0200	0.0716
E10 Eaves (insulation at ceiling level)	16.3200	0.0600	0.9792
E12 Gable (insulation at ceiling level)	9.2200	0.0600	0.5532
E25 Staggered party wall between dwellings	7.9500	0.0600	0.4770
P4 Party wall - Roof (insulation at ceiling level)	10.3600	0.1200	1.2432
E20 Exposed floor (normal)	6.7700	0.3200	2.1664
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.0817 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.4977 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.8829	30.7134	30.5472	29.7665	29.6204	28.9405	28.9405	28.8146	29.2024	29.6204	29.9159	30.2248	(38)
Heat transfer coeff	81.3806	81.2110	81.0448	80.2641	80.1181	79.4381	79.4381	79.3122	79.7000	80.1181	80.4136	80.7225	(39)
Average = Sum(39)m / 12 =												80.2634	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2154	1.2128	1.2103	1.1987	1.1965	1.1864	1.1864	1.1845	1.1903	1.1965	1.2009	1.2055	(40)
HLP (average)												1.1987	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.1701 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day)		57.7819 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.0397	61.3107	59.4229	57.0730	54.9768	52.7982	52.3454	54.2293	56.1616	58.3988	60.7695	62.9512	(44)
Energy conte	99.8395	87.3056	91.3308	78.1301	74.0093	64.9216	63.3072	67.1472	69.2529	79.2467	86.5774	98.5664	(45)

Energy content (annual)	Total = Sum(45)m =	959.6345

Distribution loss (46)m = 0.15 x (45)m

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	84.8636	74.2098	77.6312	66.4106	62.9079	55.1833	53.8111	57.0751	58.8649	67.3597	73.5907	83.7814	(64)
									Total per year (kWh/year) = Sum(64)m =			815.6894	(64)
12Total per year (kWh/year)												816	(64)
Electric shower(s)													
	48.5348	43.2449	47.2218	45.0632	45.9088	43.7925	45.2523	45.9088	45.0632	47.2218	46.3339	48.5348	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				552.0809	(64a)
Heat gains from water heating, kWh/month													
	33.3496	29.3637	31.2132	27.8684	27.2042	24.7440	24.7658	25.7460	25.9820	28.6454	29.9812	33.0791	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	95.9281	106.2061	95.9281	99.1257	95.9281	99.1257	95.9281	95.9281	99.1257	95.9281	99.1257	95.9281	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	44.8247	43.6959	41.9533	38.7062	36.5647	34.3666	33.2874	34.6048	36.0862	38.5018	41.6405	44.4611	(72)
Total internal gains													
	386.4052	397.5270	380.5353	369.9031	351.2053	339.6495	326.9849	326.3297	335.9796	345.7804	365.4754	377.6538	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.0100	10.6334	0.6300	0.7000	0.7700	19.5307	(74)
East	8.6700	19.6403	0.6300	0.7000	0.7700	52.0401	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	71.5708	139.1257	231.0755	346.3848	436.8907	453.6649	429.2024	359.6790	271.2418	165.2256	88.9816	59.0770	(83)
Total gains	457.9760	536.6527	611.6108	716.2879	788.0960	793.3144	756.1874	686.0087	607.2214	511.0061	454.4570	436.7308	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.4017	51.5091	51.6147	52.1167	52.2118	52.6587	52.6587	52.7423	52.4856	52.2118	52.0199	51.8208	
alpha	4.4268	4.4339	4.4410	4.4744	4.4808	4.5106	4.5106	4.5162	4.4990	4.4808	4.4680	4.4547	
util living area													
	0.9946	0.9885	0.9728	0.9171	0.7939	0.6070	0.4545	0.5170	0.7754	0.9536	0.9893	0.9956	(86)
MIT	19.4488	19.6654	20.0031	20.4587	20.7942	20.9536	20.9899	20.9824	20.8636	20.4039	19.8497	19.4153	(87)
Th 2	19.9077	19.9098	19.9117	19.9210	19.9228	19.9309	19.9309	19.9324	19.9278	19.9228	19.9193	19.9156	(88)
util rest of house													
	0.9930	0.9851	0.9644	0.8920	0.7377	0.5187	0.3479	0.4041	0.6951	0.9341	0.9854	0.9943	(89)
MIT 2	18.5079	18.7241	19.0575	19.4979	19.7894	19.9102	19.9283	19.9274	19.8546	19.4583	18.9156	18.4805	(90)
Living area fraction										fLA = Living area / (4) =		0.3605	(91)
MIT	18.8471	19.0635	19.3984	19.8443	20.1517	20.2864	20.3110	20.3077	20.2184	19.7992	19.2523	18.8175	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8471	19.0635	19.3984	19.8443	20.1517	20.2864	20.3110	20.3077	20.2184	19.7992	19.2523	18.8175	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9815	0.9594	0.8899	0.7507	0.5492	0.3864	0.4449	0.7189	0.9314	0.9822	0.9924	(94)
Useful gains	453.7583	526.7514	586.7903	637.4233	591.5956	435.6569	292.2140	305.1751	436.5373	475.9262	446.3871	433.4309	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1183.8531	1150.2295	1045.3477	878.4341	677.1302	451.7146	294.7967	309.9319	487.6339	737.0214	977.2123	1179.9591	(97)
Space heating kWh													
	543.1905	418.9772	341.1667	173.5278	63.6377	0.0000	0.0000	0.0000	0.0000	194.2548	382.1941	555.4169	(98a)
Space heating requirement - total per year (kWh/year)												2672.3658	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	543.1905	418.9772	341.1667	173.5278	63.6377	0.0000	0.0000	0.0000	0.0000	194.2548	382.1941	555.4169	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2672.3658	
Space heating per m2											(98c) / (4) =	39.9099	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	746.7185	587.8422	602.7729	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8828	0.9327	0.9029	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	659.2270	548.2879	544.2367	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	891.3951	849.8803	769.7116	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	167.1610	224.3847	167.7534	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	41.7903	56.0962	41.9383	0.0000	0.0000	0.0000	0.0000 (107)

Space cooling requirement	139.8248 (107)
Energy for space heating	39.9099 (99)
Energy for space cooling	2.0882 (108)
Total	41.9981 (109)
Fabric Energy Efficiency (TFEE)	42.0 (109)

Full SAP Calculation Printout

Plot Reference	P-17	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-17
Plot Address	Flat 12, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	78 C	**DER**	6.05	**TER**	14.87
Environmental	95 A	**% DER < TER**			59.31
CO_2 Emissions (t/year)	0.33	**DFEE**	42.47	**TFEE**	42.00
Compliance Check	See BREL	**% DFEE < TFEE**			-1.13
% DPER < TPER	21.09	**DPER**	62.30	**TPER**	78.96

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600 (1b)	x	2.4000 (2b)	=	160.7040	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.7040	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			7.9200	1.1450	9.0687			(27)
Window -Red			11.4100	1.2357	14.0998			(27)
Exposed Floor			5.7100	0.1275	0.7281	0.0000	0.0000	(28b)
Brickwork	60.4100	21.3900	39.0200	0.2100	8.1942	110.0000	4292.2000	(29a)
Communal Wall	14.3300		14.3300	0.2200	3.1526	110.0000	1576.3000	(29a)
Cold Roof	66.9500		66.9500	0.0900	6.0255	9.0000	602.5500	(30)
Total net area of external elements Aum(A, m2)			147.4000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.7409			(33)
Main dwelling								
Party Wall 1			27.9700	0.0000	0.0000	110.0000	3076.6999	(32)
Party Floor 1			61.2400			70.0000	4286.8000	(32d)
Internal Wall 1			136.0700			9.0000	1224.6301	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15059.1800	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 224.8982 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.8300	0.0380	0.6395
E16 Corner (normal)	11.0000	0.0540	0.5940
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0970	-0.8003
E18 Party wall between dwellings	2.7500	0.0380	0.1045
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.3600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.1700	0.0500	0.4585
E4 Jamb	32.4400	0.0160	0.5190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.5800	0.3300	1.1814
E10 Eaves (insulation at ceiling level)	16.3200	0.0630	1.0282
E12 Gable (insulation at ceiling level)	9.2200	0.0980	0.9036
E25 Staggered party wall between dwellings	7.9500	0.0310	0.2465
P4 Party wall - Roof (insulation at ceiling level)	10.3600	0.1010	1.0464
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4777 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 53.2185 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.8335	15.6644	15.4954	14.6502	14.4811	13.6359	13.6359	13.4669	13.9740	14.4811	14.8192	15.1573	(38)
Heat transfer coeff	69.0520	68.8829	68.7139	67.8687	67.6997	66.8545	66.8545	66.6854	67.1925	67.6997	68.0377	68.3758	(39)
Average = Sum(39)m / 12 =												67.8264	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0312	1.0287	1.0262	1.0136	1.0110	0.9984	0.9984	0.9959	1.0035	1.0110	1.0161	1.0211	(40)
HLP (average)												1.0129	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)
Hot water usage for baths	26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)
Hot water usage for other uses	36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)
Average daily hot water use (litres/day)												113.6581	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
										Total per year (kWh/year) = Sum(64)m =		2232.7623	(64)
12Total per year (kWh/year)												2233	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8839	106.1572	95.8839	99.0800	95.8839	99.0800	95.8839	95.8839	99.0800	95.8839	99.0800	95.8839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains	429.0515	439.0397	419.4459	402.5261	380.1320	364.6692	349.3364	350.4609	362.2593	376.4184	402.1120	419.4449	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
North					7.9200	10.6334		0.3300		0.0000	0.7700	21.3994	(74)
East					11.4100	19.6403		0.3100		0.0000	0.7700	53.4916	(76)
Solar gains	74.8910	145.5362	241.8198	362.9517	458.3789	476.2771	450.4713	377.0876	283.9762	172.8458	93.0966	61.8285	(83)
Total gains	503.9425	584.5759	661.2657	765.4778	838.5108	840.9463	799.8077	727.5485	646.2355	549.2642	495.2086	481.2733	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.5791	60.7277	60.8771	61.6353	61.7892	62.5703	62.5703	62.7289	62.2555	61.7892	61.4821	61.1781	
alpha	5.0386	5.0485	5.0585	5.1090	5.1193	5.1714	5.1714	5.1819	5.1504	5.1193	5.0988	5.0785	
util living area	0.9913	0.9809	0.9539	0.8642	0.6987	0.5011	0.3665	0.4188	0.6753	0.9210	0.9821	0.9930	(86)
MIT	19.8360	20.0458	20.3483	20.7146	20.9218	20.9884	20.9981	20.9964	20.9513	20.6456	20.1794	19.8030	(87)
Th 2	20.0574	20.0595	20.0616	20.0720	20.0741	20.0846	20.0846	20.0868	20.0804	20.0741	20.0699	20.0658	(88)
util rest of house	0.9888	0.9757	0.9415	0.8323	0.6436	0.4326	0.2909	0.3371	0.6003	0.8940	0.9762	0.9910	(89)
MIT 2	18.7097	18.9762	19.3540	19.7943	20.0116	20.0781	20.0840	20.0854	20.0485	19.7292	19.1554	18.6738	(90)
Living area fraction									fLA = Living area / (4) =			0.3605	(91)
MIT	19.1157	19.3618	19.7125	20.1261	20.3397	20.4063	20.4135	20.4138	20.3740	20.0596	19.5245	19.0809	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1157	19.3618	19.7125	20.1261	20.3397	20.4063	20.4135	20.4138	20.3740	20.0596	19.5245	19.0809	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9855	0.9708	0.9360	0.8343	0.6600	0.4570	0.3182	0.3666	0.6253	0.8935	0.9718	0.9881	(94)
Useful gains	496.6251	567.5183	618.9129	638.6703	553.4479	384.3061	254.4824	266.7100	404.0620	490.7876	481.2512	475.5509	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1023.0560	996.1697	907.8813	761.8996	584.9077	388.1751	254.9528	267.6626	421.5628	640.4106	845.3381	1017.4914	(97)
Space heating kWh	391.6646	288.0538	214.9925	88.7251	23.4060	0.0000	0.0000	0.0000	0.0000	111.3195	262.1425	403.2037	(98a)
Space heating requirement - total per year (kWh/year)												1783.5077	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	391.6646	288.0538	214.9925	88.7251	23.4060	0.0000	0.0000	0.0000	0.0000	111.3195	262.1425	403.2037	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1783.5077	
Space heating per m2											(98c) / (4) =	26.6354	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	391.6646	288.0538	214.9925	88.7251	23.4060	0.0000	0.0000	0.0000	0.0000	111.3195	262.1425	403.2037	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	391.6646	288.0538	214.9925	88.7251	23.4060	0.0000	0.0000	0.0000	0.0000	111.3195	262.1425	403.2037	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.7828	8.8361	9.7828	9.4672	9.7828	9.4672	9.7828	9.7828	9.4672	9.7828	9.4672	9.7828	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	1783.5077	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	115.1846	(230a)
Total electricity for the above, kWh/year	115.1846	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2673.5506	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1783.5077	0.1565	279.0462	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			366.1771	(265)
Pumps, fans and electric keep-hot	115.1846	0.1387	15.9775	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			404.8870	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.0500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1783.5077	1.5792	2816.5601	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	1.5219	939.5420	(278)
Space and water heating			3756.1021	(279)
Pumps, fans and electric keep-hot	115.1846	1.5128	174.2513	(281)
Energy for lighting	157.5018	1.5338	241.5815	(282)
Total Primary energy kWh/year			4171.9349	(286)
Dwelling Primary energy Rate (DPER)			62.3000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.4000	(2b) =	160.7040	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.7040	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1245	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3745	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3183	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4058	0.3979	0.3899	0.3501	0.3422	0.3024	0.3024	0.2944	0.3183	0.3422	0.3581	0.3740 (22b)
Effective ac	0.5823	0.5791	0.5760	0.5613	0.5585	0.5457	0.5457	0.5433	0.5507	0.5585	0.5641	0.5699 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			14.6800	1.1450	16.8092			(27)
Exposed Floor			5.7100	0.1300	0.7423			(28b)
Brickwork	60.4100	16.7400	43.6700	0.1800	7.8606			(29a)
Communal Wall	14.3300		14.3300	0.1800	2.5794			(29a)
Cold Roof	66.9500		66.9500	0.1100	7.3645			(30)
Total net area of external elements Aum(A, m2)			147.4000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.4160			(33)
Main dwelling								
Party Wall 1			27.9700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 224.8982 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.8300	0.0700	1.1781
E16 Corner (normal)	11.0000	0.0900	0.9900
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0900	-0.7425
E18 Party wall between dwellings	2.7500	0.0600	0.1650
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.3600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.1700	0.0500	0.4585
E4 Jamb	32.4400	0.0500	1.6220
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.5800	0.0200	0.0716
E10 Eaves (insulation at ceiling level)	16.3200	0.0600	0.9792
E12 Gable (insulation at ceiling level)	9.2200	0.0600	0.5532
E25 Staggered party wall between dwellings	7.9500	0.0600	0.4770
P4 Party wall - Roof (insulation at ceiling level)	10.3600	0.1200	1.2432
E20 Exposed floor (normal)	6.7700	0.3200	2.1664
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.0817 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 50.4977 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.8829	30.7134	30.5472	29.7665	29.6204	28.9405	28.9405	28.8146	29.2024	29.6204	29.9159	30.2248	(38)
Heat transfer coeff	81.3806	81.2110	81.0448	80.2641	80.1181	79.4381	79.4381	79.3122	79.7000	80.1181	80.4136	80.7225	(39)
Average = Sum(39)m / 12 =												80.2634	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2154	1.2128	1.2103	1.1987	1.1965	1.1864	1.1864	1.1845	1.1903	1.1965	1.2009	1.2055	(40)
HLP (average)												1.1987	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)											Total = Sum(45)m =	1887.8373	
Distribution loss (46)m = 0.15 x (45)m	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	242.4186	214.3957	227.6343	199.6478	193.2368	173.7866	171.1909	178.1211	180.2384	201.4005	214.6928	239.6911	(62)
WWHRS	-27.7063	-24.5036	-25.6588	-21.2465	-19.8010	-16.9438	-15.8821	-16.8891	-17.5307	-20.6668	-23.4130	-27.1932	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
										Total per year (kWh/year) = Sum(64)m =		2179.0197	(64)
12Total per year (kWh/year)												2179	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.3873	90.9616	97.4715	87.4633	86.0344	78.8645	78.7041	81.0084	81.0097	88.7488	92.4658	101.4804	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	108.5060	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	95.9281	106.2061	95.9281	99.1257	95.9281	99.1257	95.9281	95.9281	99.1257	95.9281	99.1257	95.9281	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	190.1005	192.0732	187.1022	176.5195	163.1607	150.6054	142.2177	140.2450	145.2160	155.7987	169.1575	181.7128	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	33.8506	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	137.6173	135.3596	131.0101	121.4769	115.6376	109.5340	105.7851	108.8822	112.5135	119.2860	128.4247	136.3984	(72)
Total internal gains													
	482.1978	492.1906	472.5921	455.6738	433.2782	414.8169	399.4826	400.6071	412.4070	429.5646	455.2597	472.5911	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.0100	10.6334	0.6300	0.7000	0.7700	19.5307	(74)
East	8.6700	19.6403	0.6300	0.7000	0.7700	52.0401	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	71.5708	139.1257	231.0755	346.3848	436.8907	453.6649	429.2024	359.6790	271.2418	165.2256	88.9816	59.0770	(83)
Total gains	553.7686	631.3163	703.6676	802.0586	870.1689	868.4818	828.6850	760.2861	683.6488	594.7902	544.2412	531.6681	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.4017	51.5091	51.6147	52.1167	52.2118	52.6587	52.6587	52.7423	52.4856	52.2118	52.0199	51.8208	
alpha	4.4268	4.4339	4.4410	4.4744	4.4808	4.5106	4.5106	4.5162	4.4990	4.4808	4.4680	4.4547	
util living area	0.9888	0.9791	0.9562	0.8860	0.7491	0.5625	0.4168	0.4706	0.7197	0.9250	0.9790	0.9906	(86)
MIT	19.6069	19.8159	20.1368	20.5513	20.8393	20.9657	20.9928	20.9879	20.9001	20.5123	19.9930	19.5732	(87)
Th 2	19.9077	19.9098	19.9117	19.9210	19.9228	19.9309	19.9309	19.9324	19.9278	19.9228	19.9193	19.9156	(88)
util rest of house	0.9855	0.9732	0.9436	0.8550	0.6895	0.4776	0.3180	0.3659	0.6360	0.8970	0.9719	0.9878	(89)
MIT 2	18.3119	18.5773	18.9790	19.4815	19.7928	19.9117	19.9286	19.9281	19.8620	19.4510	18.8106	18.2748	(90)
Living area fraction									fLA = Living area / (4) =			0.3605	(91)
MIT	18.7788	19.0238	19.3964	19.8672	20.1701	20.2917	20.3123	20.3102	20.2363	19.8336	19.2368	18.7429	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7788	19.0238	19.3964	19.8672	20.1701	20.2917	20.3123	20.3102	20.2363	19.8336	19.2368	18.7429	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9669	0.9362	0.8532	0.7041	0.5071	0.3537	0.4037	0.6618	0.8943	0.9661	0.9837	(94)
Useful gains	543.2187	610.3979	658.7784	684.3174	612.7100	440.4072	293.0930	306.9016	452.4075	531.9027	525.7706	523.0169	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1178.2917	1147.0109	1045.1875	880.2724	678.6066	452.1380	294.8965	310.1245	489.0617	739.7798	975.9668	1173.9386	(97)
Space heating kWh	472.4943	360.6040	287.4883	141.0876	49.0271	0.0000	0.0000	0.0000	0.0000	154.6606	324.1412	484.2858	(98a)
Space heating requirement - total per year (kWh/year)												2273.7889	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	472.4943	360.6040	287.4883	141.0876	49.0271	0.0000	0.0000	0.0000	0.0000	154.6606	324.1412	484.2858	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2273.7889	
Space heating per m2											(98c) / (4) =	33.9574	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	472.4943	360.6040	287.4883	141.0876	49.0271	0.0000	0.0000	0.0000	0.0000	154.6606	324.1412	484.2858	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	511.9115	390.6869	311.4717	152.8576	53.1171	0.0000	0.0000	0.0000	0.0000	167.5629	351.1823	524.6866	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	214.7123	189.8920	201.9755	178.4013	173.4358	156.8428	155.3087	161.2320	162.7076	180.7337	191.2798	212.4980	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7774	85.4747	84.8511	83.5390	81.6231	79.8000	79.8000	79.8000	79.8000	83.7124	85.2326	85.8473	(217)
Fuel for water heating, kWh/month	250.3134	222.1617	238.0352	213.5546	212.4837	196.5449	194.6225	202.0451	203.8943	215.8984	224.4210	247.5302	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	19.9320	15.9902	14.3974	10.5481	8.1477	6.6567	7.4326	9.6612	12.5489	16.4648	18.5970	20.4859	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.9732	-26.6464	-40.2581	-47.6577	-53.5008	-50.7180	-50.1042	-46.2523	-39.8278	-31.5153	-20.2200	-15.3904	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.5375	-14.0493	-28.4829	-43.6093	-58.4788	-59.0518	-58.3524	-49.0281	-35.4450	-20.3565	-8.8131	-5.1475	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2463.4765	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2621.5049	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	160.8623	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-827.4164	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4504.4273	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2463.4765	0.2100	517.3301	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2621.5049	0.2100	550.5160	(264)
Space and water heating			1067.8461	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.8623	0.1443	23.2174	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0642	0.1335	-58.7646	
PV Unit electricity exported	-387.3523	0.1253	-48.5504	
Total			-107.3150	(269)
Total CO2, kg/year			995.6778	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2463.4765	1.1300	2783.7285	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2621.5049	1.1300	2962.3005	(278)
Space and water heating			5746.0290	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.8623	1.5338	246.7360	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-440.0642	1.4935	-657.2219	
PV Unit electricity exported	-387.3523	0.4601	-178.2030	
Total			-835.4249	(283)
Total Primary energy kWh/year			5287.4409	(286)
Target Primary Energy Rate (TPER)			78.9600	(287)

Full SAP Calculation Printout

Plot Reference	P-17	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-17
Plot Address	Flat 12, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	78 C	**DER**	6.05	**TER**	14.87
Environmental	95 A	**% DER < TER**			59.31
CO_2 Emissions (t/year)	0.33	**DFEE**	42.47	**TFEE**	42.00
Compliance Check	See BREL	**% DFEE < TFEE**			-1.13
% DPER < TPER	21.09	**DPER**	62.30	**TPER**	78.96

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.4000	(2b) =	160.7040	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	160.7040	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			7.9200	1.1450	9.0687			(27)
Window -Red			11.4100	1.2357	14.0998			(27)
Exposed Floor			5.7100	0.1275	0.7281	0.0000	0.0000	(28b)
Brickwork	60.4100	21.3900	39.0200	0.2100	8.1942	110.0000	4292.2000	(29a)
Communal Wall	14.3300		14.3300	0.2200	3.1526	110.0000	1576.3000	(29a)
Cold Roof	66.9500		66.9500	0.0900	6.0255	9.0000	602.5500	(30)
Total net area of external elements Aum(A, m2)			147.4000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.7409			(33)
Main dwelling								
Party Wall 1			27.9700	0.0000	0.0000	110.0000	3076.6999	(32)
Party Floor 1			61.2400			70.0000	4286.8000	(32d)
Internal Wall 1			136.0700			9.0000	1224.6301	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15059.1800 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 224.8982 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.8300	0.0380	0.6395
E16 Corner (normal)	11.0000	0.0540	0.5940
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0970	-0.8003
E18 Party wall between dwellings	2.7500	0.0380	0.1045
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.3600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.1700	0.0500	0.4585
E4 Jamb	32.4400	0.0160	0.5190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.5800	0.3300	1.1814
E10 Eaves (insulation at ceiling level)	16.3200	0.0630	1.0282
E12 Gable (insulation at ceiling level)	9.2200	0.0980	0.9036
E25 Staggered party wall between dwellings	7.9500	0.0310	0.2465
P4 Party wall - Roof (insulation at ceiling level)	10.3600	0.1010	1.0464
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4777 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 53.2185 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.8335	15.6644	15.4954	14.6502	14.4811	13.6359	13.6359	13.4669	13.9740	14.4811	14.8192	15.1573	(38)

Heat transfer coeff

	69.0520	68.8829	68.7139	67.8687	67.6997	66.8545	66.8545	66.6854	67.1925	67.6997	68.0377	68.3758	(39)

Average = Sum(39)m / 12 = 67.8264

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0312	1.0287	1.0262	1.0136	1.0110	0.9984	0.9984	0.9959	1.0035	1.0110	1.0161	1.0211	(40)
HLP (average)												1.0129	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)

Energy content (annual) Total = Sum(45)m = 1887.8373

Distribution loss (46)m = 0.15 x (45)m

29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)

Total per year (kWh/year) = Sum(64)m = 2232.7623 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains													
	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North				7.9200		10.6334		0.3300		0.0000		0.7700	21.3994 (74)
East				11.4100		19.6403		0.3100		0.0000		0.7700	53.4916 (76)
Solar gains	74.8910	145.5362	241.8198	362.9517	458.3789	476.2771	450.4713	377.0876	283.9762	172.8458	93.0966	61.8285 (83)	
Total gains	562.0277	630.8665	711.6831	803.5742	870.1452	861.7810	820.3269	749.5890	671.2264	586.5760	538.9825	535.8469 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.5791	60.7277	60.8771	61.6353	61.7892	62.5703	62.5703	62.7289	62.2555	61.7892	61.4821	61.1781	
alpha	5.0386	5.0485	5.0585	5.1090	5.1193	5.1714	5.1714	5.1819	5.1504	5.1193	5.0988	5.0785	
util living area	0.9861	0.9742	0.9401	0.8452	0.6793	0.4897	0.3574	0.4069	0.6553	0.9026	0.9747	0.9888 (86)	
MIT	19.9334	20.1190	20.4166	20.7462	20.9311	20.9895	20.9983	20.9968	20.9574	20.6877	20.2491	19.8957 (87)	
Th 2	20.0574	20.0595	20.0616	20.0720	20.0741	20.0846	20.0846	20.0868	20.0804	20.0741	20.0699	20.0658 (88)	
util rest of house	0.9823	0.9674	0.9249	0.8111	0.6242	0.4225	0.2837	0.3273	0.5808	0.8716	0.9668	0.9857 (89)	
MIT 2	18.8326	19.0673	19.4357	19.8279	20.0196	20.0788	20.0841	20.0856	20.0529	19.7755	19.2417	18.7912 (90)	
Living area fraction										fLA = Living area / (4) =		0.3605 (91)	
MIT	19.2295	19.4465	19.7893	20.1590	20.3482	20.4071	20.4137	20.4141	20.3790	20.1044	19.6049	19.1894 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2295	19.4465	19.7893	20.1590	20.3482	20.4071	20.4137	20.4141	20.3790	20.1044	19.6049	19.1894 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9780	0.9618	0.9198	0.8146	0.6411	0.4465	0.3103	0.3560	0.6059	0.8727	0.9619	0.9819 (94)	
Useful gains	549.6853	606.7962	654.5725	654.5603	557.8383	384.7533	254.5435	266.8511	406.6881	511.9082	518.4481	526.1667 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	1030.9102	1002.0056	913.1589	764.1319	585.4812	388.2316	254.9609	267.6812	421.9011	643.4420	850.8056	1024.9103 (97)	
Space heating kWh	358.0313	265.5807	192.3883	78.8915	20.5663	0.0000	0.0000	0.0000	0.0000	97.8612	239.2974	371.0653 (98a)	
Space heating requirement - total per year (kWh/year)												1623.6821	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	358.0313	265.5807	192.3883	78.8915	20.5663	0.0000	0.0000	0.0000	0.0000	97.8612	239.2974	371.0653 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1623.6821	
Space heating per m2											(98c) / (4) =	24.2485 (99)	

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	358.0313	265.5807	192.3883	78.8915	20.5663	0.0000	0.0000	0.0000	0.0000	97.8612	239.2974	371.0653 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	358.0313	265.5807	192.3883	78.8915	20.5663	0.0000	0.0000	0.0000	0.0000	97.8612	239.2974	371.0653 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912 (64)	
Efficiency of water heater												361.6650 (216)	
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)	
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	9.7828	8.8361	9.7828	9.4672	9.7828	9.4672	9.7828	9.7828	9.4672	9.7828	9.4672	9.7828 (231)	
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												1623.6821 (211)	

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	115.1846	(230a)
Total electricity for the above, kWh/year	115.1846	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2513.7249	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1623.6821	16.4900	267.7452	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	16.4900	101.8021	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	115.1846	16.4900	18.9939	(249)
Energy for lighting	157.5018	16.4900	25.9720	(250)
Additional standing charges			0.0000	(251)
Total energy cost			414.5132	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3328	(257)
SAP value		78.3947	
SAP rating (Section 12)		78	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1623.6821	0.1566	254.2103	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			341.3412	(265)
Pumps, fans and electric keep-hot	115.1846	0.1387	15.9775	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			380.0511	(272)
CO2 emissions per m2			5.6800	(273)
EI value			95.4513	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	66.9600 (1b)	x 2.4000 (2b)	= 160.7040	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 66.9600				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	160.7040	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												2	(19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate													
	0.1371	0.1307	0.1307	0.1211	0.1243	0.1084	0.1084	0.1052	0.1084	0.1211	0.1179	0.1275	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2731	0.2667	0.2667	0.2571	0.2603	0.2444	0.2444	0.2412	0.2444	0.2571	0.2539	0.2635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			7.9200	1.1450	9.0687			(27)
Window -Red			11.4100	1.2357	14.0998			(27)
Exposed Floor			5.7100	0.1275	0.7281	0.0000	0.0000	(28b)
Brickwork	60.4100	21.3900	39.0200	0.2100	8.1942	110.0000	4292.2000	(29a)
Communal Wall	14.3300		14.3300	0.2200	3.1526	110.0000	1576.3000	(29a)
Cold Roof	66.9500		66.9500	0.0900	6.0255	9.0000	602.5500	(30)
Total net area of external elements Aum(A, m2)			147.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.7409			(33)
Main dwelling								
Party Wall 1			27.9700	0.0000	0.0000	110.0000	3076.6999	(32)
Party Floor 1			61.2400			70.0000	4286.8000	(32d)
Internal Wall 1			136.0700			9.0000	1224.6301	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15059.1800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	224.8982	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.8300	0.0380	0.6395
E16 Corner (normal)	11.0000	0.0540	0.5940
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0970	-0.8003
E18 Party wall between dwellings	2.7500	0.0380	0.1045
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.3600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.1700	0.0500	0.4585
E4 Jamb	32.4400	0.0160	0.5190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.5800	0.3300	1.1814
E10 Eaves (insulation at ceiling level)	16.3200	0.0630	1.0282
E12 Gable (insulation at ceiling level)	9.2200	0.0980	0.9036
E25 Staggered party wall between dwellings	7.9500	0.0310	0.2465
P4 Party wall - Roof (insulation at ceiling level)	10.3600	0.1010	1.0464
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.4777	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	53.2185	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.4811	14.1431	14.1431	13.6359	13.8050	12.9598	12.9598	12.7907	12.9598	13.6359	13.4669	13.9740	(38)
Heat transfer coeff													
	67.6997	67.3616	67.3616	66.8545	67.0235	66.1783	66.1783	66.0093	66.1783	66.8545	66.6854	67.1925	(39)
Average = Sum(39)m / 12 =												66.7981	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0110	1.0060	1.0060	0.9984	1.0009	0.9883	0.9883	0.9858	0.9883	0.9984	0.9959	1.0035	(40)
HLP (average)												0.9976	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1701	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day)	113.6581	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	

Distribution loss (46)m = 0.15 x (45)m

29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)

Primary loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
											Total per year (kWh/year) = Sum(64)m =	2232.7623	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains													
	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.9200	12.7650	0.3300	0.0000	0.7700	25.6893	(74)
East	11.4100	23.8018	0.3100	0.0000	0.7700	64.8257	(76)

Solar gains	90.5150	154.0643	254.6067	387.9628	476.7988	523.6188	490.5479	421.5342	318.8010	196.5641	110.9257	75.1007	(83)
Total gains	577.6517	639.3946	724.4699	828.5853	888.5651	909.1227	860.4034	794.0356	706.0512	610.2944	556.8116	549.1191	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.7892	62.0993	62.0993	62.5703	62.4125	63.2096	63.2096	63.3715	63.2096	62.5703	62.7289	62.2555	
alpha	5.1193	5.1400	5.1400	5.1714	5.1608	5.2140	5.2140	5.2248	5.2140	5.1714	5.1819	5.1504	
util living area													
	0.9804	0.9655	0.9180	0.7885	0.5913	0.3770	0.2537	0.2824	0.5498	0.8542	0.9614	0.9840	(86)
MIT	20.0879	20.2603	20.5506	20.8409	20.9687	20.9976	20.9998	20.9996	20.9840	20.7960	20.4053	20.0543	(87)
Th 2	20.0741	20.0783	20.0783	20.0846	20.0825	20.0931	20.0931	20.0952	20.0931	20.0846	20.0868	20.0804	(88)
util rest of house													
	0.9750	0.9564	0.8976	0.7462	0.5310	0.3120	0.1840	0.2074	0.4720	0.8112	0.9494	0.9795	(89)
MIT 2	19.0405	19.2583	19.6103	19.9406	20.0606	20.0920	20.0930	20.0951	20.0844	19.9032	19.4483	19.0033	(90)
Living area fraction										fLA = Living area / (4) =		0.3605	(91)
MIT	19.4181	19.6195	19.9493	20.2652	20.3880	20.4185	20.4199	20.4212	20.4087	20.2251	19.7933	19.3822	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4181	19.6195	19.9493	20.2652	20.3880	20.4185	20.4199	20.4212	20.4087	20.2251	19.7933	19.3822	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9509	0.8943	0.7550	0.5515	0.3354	0.2092	0.2344	0.4996	0.8184	0.9447	0.9751	(94)
Useful gains	560.4344	607.9751	647.9200	625.6022	490.0697	304.9527	179.9590	186.1515	352.7538	499.4863	526.0029	535.4278	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	969.3290	937.6403	845.3416	692.9583	501.8712	305.6436	179.9998	186.2245	357.9401	583.3092	786.4426	959.6576	(97)
Space heating kWh													
	304.2176	221.5350	146.8817	48.4964	8.7803	0.0000	0.0000	0.0000	0.0000	62.3642	187.5166	315.6270	(98a)
Space heating requirement - total per year (kWh/year)												1295.4189	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	304.2176	221.5350	146.8817	48.4964	8.7803	0.0000	0.0000	0.0000	0.0000	62.3642	187.5166	315.6270	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1295.4189	
Space heating per m2											(98c) / (4) =	19.3462	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	304.2176	221.5350	146.8817	48.4964	8.7803	0.0000	0.0000	0.0000	0.0000	62.3642	187.5166	315.6270	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	304.2176	221.5350	146.8817	48.4964	8.7803	0.0000	0.0000	0.0000	0.0000	62.3642	187.5166	315.6270	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.7828	8.8361	9.7828	9.4672	9.7828	9.4672	9.7828	9.7828	9.4672	9.7828	9.4672	9.7828	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1295.4189 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 617.3565 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 115.1846 (230a)
Total electricity for the above, kWh/year 115.1846 (231)
Electricity for lighting (calculated in Appendix L) 157.5018 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2185.4618 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1295.4189	27.6700	358.4424	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	27.6700	170.8225	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	115.1846	27.6700	31.8716	(249)
Energy for lighting	157.5018	27.6700	43.5808	(250)
Additional standing charges			0.0000	(251)
Total energy cost			604.7173	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4189	0.1574	203.8437	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			290.9746	(265)
Pumps, fans and electric keep-hot	115.1846	0.1387	15.9775	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			329.6845	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4189	1.5825	2050.0406	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)

Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	617.3565	1.5219	939.5420 (278)
Space and water heating			2989.5826 (279)
Pumps, fans and electric keep-hot	115.1846	1.5128	174.2513 (281)
Energy for lighting	157.5018	1.5338	241.5815 (282)
Total Primary energy kWh/year			3405.4154 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 78
Current environmental impact rating: A 95

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 78
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£605	£605	£0
Space heating	£390	£390	£0
Water heating	£171	£171	£0
Lighting	£44	£44	£0
Total cost of fuels	£605	£605	£0
Total cost of uses	£605	£605	£0
Delivered energy	33 kWh/m²	33 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	51 kWh/m²	51 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.4000	(2b) =	160.7040	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.7040	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2986	0.2954	0.2922	0.2762	0.2731	0.2571	0.2571	0.2539	0.2635	0.2731	0.2794	0.2858	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Window			7.9200	1.1450	9.0687			(27)
Window -Red			11.4100	1.2357	14.0998			(27)
Exposed Floor			5.7100	0.1275	0.7281	0.0000	0.0000	(28b)
Brickwork	60.4100	21.3900	39.0200	0.2100	8.1942	110.0000	4292.2000	(29a)
Communal Wall	14.3300		14.3300	0.2200	3.1526	110.0000	1576.3000	(29a)
Cold Roof	66.9500		66.9500	0.0900	6.0255	9.0000	602.5500	(30)
Total net area of external elements Aum(A, m2)			147.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.7409			(33)
Main dwelling								
Party Wall 1			27.9700	0.0000	0.0000	110.0000	3076.6999	(32)
Party Floor 1			61.2400			70.0000	4286.8000	(32d)
Internal Wall 1			136.0700			9.0000	1224.6301	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15059.1800 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 224.8982 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.8300	0.0380	0.6395
E16 Corner (normal)	11.0000	0.0540	0.5940
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0970	-0.8003
E18 Party wall between dwellings	2.7500	0.0380	0.1045
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.3600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.1700	0.0500	0.4585
E4 Jamb	32.4400	0.0160	0.5190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.5800	0.3300	1.1814
E10 Eaves (insulation at ceiling level)	16.3200	0.0630	1.0282
E12 Gable (insulation at ceiling level)	9.2200	0.0980	0.9036
E25 Staggered party wall between dwellings	7.9500	0.0310	0.2465
P4 Party wall - Roof (insulation at ceiling level)	10.3600	0.1010	1.0464
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4777 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 53.2185 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.8335	15.6644	15.4954	14.6502	14.4811	13.6359	13.6359	13.4669	13.9740	14.4811	14.8192	15.1573	(38)
Heat transfer coeff	69.0520	68.8829	68.7139	67.8687	67.6997	66.8545	66.8545	66.6854	67.1925	67.6997	68.0377	68.3758	(39)

Average = Sum(39)m / 12 = 67.8264

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0312	1.0287	1.0262	1.0136	1.0110	0.9984	0.9984	0.9959	1.0035	1.0110	1.0161	1.0211	(40)
HLP (average)												1.0129	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732	(42a)

Hot water usage for baths

26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970	(42b)

Hot water usage for other uses

36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542	(42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)

Energy content (annual) Total = Sum(45)m = 1887.8373

Distribution loss (46)m = 0.15 x (45)m

29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)

Total per year (kWh/year) = Sum(64)m = 2232.7623 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)

Water heating gains (Table 5)

	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)

Total internal gains

	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.9200	10.6334	0.3300	0.0000	0.7700	21.3994	(74)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)

Solar gains	74.8910	145.5362	241.8198	362.9517	458.3789	476.2771	450.4713	377.0876	283.9762	172.8458	93.0966	61.8285	(83)
Total gains	562.0277	630.8665	711.6831	803.5742	870.1452	861.7810	820.3269	749.5890	671.2264	586.5760	538.9825	535.8469	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.5791	60.7277	60.8771	61.6353	61.7892	62.5703	62.5703	62.7289	62.2555	61.7892	61.4821	61.1781	
alpha	5.0386	5.0485	5.0585	5.1090	5.1193	5.1714	5.1714	5.1819	5.1504	5.1193	5.0988	5.0785	
util living area	0.9861	0.9742	0.9401	0.8452	0.6793	0.4897	0.3574	0.4069	0.6553	0.9026	0.9747	0.9888	(86)
MIT	19.9334	20.1190	20.4166	20.7462	20.9311	20.9895	20.9983	20.9968	20.9574	20.6877	20.2491	19.8957	(87)
Th 2	20.0574	20.0595	20.0616	20.0720	20.0741	20.0846	20.0846	20.0868	20.0804	20.0741	20.0699	20.0658	(88)
util rest of house	0.9823	0.9674	0.9249	0.8111	0.6242	0.4225	0.2837	0.3273	0.5808	0.8716	0.9668	0.9857	(89)
MIT 2	18.8326	19.0673	19.4357	19.8279	20.0196	20.0788	20.0841	20.0856	20.0529	19.7755	19.2417	18.7912	(90)
Living area fraction										fLA = Living area / (4) =		0.3605	(91)
MIT	19.2295	19.4465	19.7893	20.1590	20.3482	20.4071	20.4137	20.4141	20.3790	20.1044	19.6049	19.1894	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2295	19.4465	19.7893	20.1590	20.3482	20.4071	20.4137	20.4141	20.3790	20.1044	19.6049	19.1894	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9780	0.9618	0.9198	0.8146	0.6411	0.4465	0.3103	0.3560	0.6059	0.8727	0.9619	0.9819	(94)
Useful gains	549.6853	606.7962	654.5725	654.5603	557.8383	384.7533	254.5435	266.8511	406.6881	511.9082	518.4481	526.1667	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1030.9102	1002.0056	913.1589	764.1319	585.4812	388.2316	254.9609	267.6812	421.9011	643.4420	850.8056	1024.9103	(97)
Space heating kWh	358.0313	265.5807	192.3883	78.8915	20.5663	0.0000	0.0000	0.0000	0.0000	97.8612	239.2974	371.0653	(98a)
Space heating requirement - total per year (kWh/year)												1623.6821	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	358.0313	265.5807	192.3883	78.8915	20.5663	0.0000	0.0000	0.0000	0.0000	97.8612	239.2974	371.0653	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1623.6821	
Space heating per m2											(98c) / (4) =	24.2485	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	358.0313	265.5807	192.3883	78.8915	20.5663	0.0000	0.0000	0.0000	0.0000	97.8612	239.2974	371.0653	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	358.0313	265.5807	192.3883	78.8915	20.5663	0.0000	0.0000	0.0000	0.0000	97.8612	239.2974	371.0653	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
225.1187 198.7700 210.3344 182.9060 175.9369 157.0448 153.8910 160.8212 163.4966 184.1006 197.9510 222.3912 (64)
Efficiency of water heater 361.6650 (216)
(217)m 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 (217)
Fuel for water heating, kWh/month
62.2451 54.9597 58.1572 50.5733 48.6464 43.4227 42.5507 44.4669 45.2066 50.9036 54.7332 61.4909 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 9.7828 8.8361 9.7828 9.4672 9.7828 9.4672 9.7828 9.7828 9.4672 9.7828 9.4672 9.7828 (231)
Lighting 19.5156 15.6561 14.0966 10.3278 7.9775 6.5177 7.2773 9.4593 12.2867 16.1209 18.2085 20.0580 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 1623.6821 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 617.3565 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 115.1846 (230a)
Total electricity for the above, kWh/year 115.1846 (231)
Electricity for lighting (calculated in Appendix L) 157.5018 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2513.7249 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1623.6821	16.4900	267.7452	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	16.4900	101.8021	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	115.1846	16.4900	18.9939	(249)
Energy for lighting	157.5018	16.4900	25.9720	(250)
Additional standing charges			0.0000	(251)
Total energy cost			414.5132	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.3328 (257)
SAP value 78.3947
SAP rating (Section 12) 78 (258)
SAP band C

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1623.6821	0.1566	254.2103	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			341.3412	(265)
Pumps, fans and electric keep-hot	115.1846	0.1387	15.9775	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			380.0511	(272)
CO2 emissions per m2			5.6800	(273)
EI value			95.4513	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	66.9600	(1b)	x 2.4000	(2b) =	160.7040	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		160.7040	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1371	0.1307	0.1307	0.1211	0.1243	0.1084	0.1084	0.1052	0.1084	0.1211	0.1179	0.1275	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2731	0.2667	0.2667	0.2571	0.2603	0.2444	0.2444	0.2412	0.2444	0.2571	0.2539	0.2635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			7.9200	1.1450	9.0687			(27)
Window -Red			11.4100	1.2357	14.0998			(27)
Exposed Floor			5.7100	0.1275	0.7281	0.0000	0.0000	(28b)
Brickwork	60.4100	21.3900	39.0200	0.2100	8.1942	110.0000	4292.2000	(29a)
Communal Wall	14.3300		14.3300	0.2200	3.1526	110.0000	1576.3000	(29a)
Cold Roof	66.9500		66.9500	0.0900	6.0255	9.0000	602.5500	(30)
Total net area of external elements Aum(A, m2)			147.4000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.7409			(33)
Main dwelling								
Party Wall 1			27.9700	0.0000	0.0000	110.0000	3076.6999	(32)
Party Floor 1			61.2400			70.0000	4286.8000	(32d)
Internal Wall 1			136.0700			9.0000	1224.6301	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15059.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	224.8982 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.8300	0.0380	0.6395
E16 Corner (normal)	11.0000	0.0540	0.5940
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0970	-0.8003
E18 Party wall between dwellings	2.7500	0.0380	0.1045
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.3600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.1700	0.0500	0.4585
E4 Jamb	32.4400	0.0160	0.5190
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.5800	0.3300	1.1814
E10 Eaves (insulation at ceiling level)	16.3200	0.0630	1.0282
E12 Gable (insulation at ceiling level)	9.2200	0.0980	0.9036
E25 Staggered party wall between dwellings	7.9500	0.0310	0.2465
P4 Party wall - Roof (insulation at ceiling level)	10.3600	0.1010	1.0464
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.4777 (36)
Point Thermal bridges (36a) =	0.0000
Total fabric heat loss (33) + (36) + (36a) =	53.2185 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	14.4811	14.1431	14.1431	13.6359	13.8050	12.9598	12.9598	12.7907	12.9598	13.6359	13.4669	13.9740	(38)
Heat transfer coeff	67.6997	67.3616	67.3616	66.8545	67.0235	66.1783	66.1783	66.0093	66.1783	66.8545	66.6854	67.1925	(39)
Average = Sum(39)m / 12 =												66.7981	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0110	1.0060	1.0060	0.9984	1.0009	0.9883	0.9883	0.9858	0.9883	0.9984	0.9959	1.0035	(40)
HLP (average)												0.9976	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1701 (42)

Hot water usage for mixer showers

	60.6054	59.6946	58.3674	55.8281	53.9541	51.8643	50.6765	51.9936	53.4374	55.6813	58.2752	60.3732 (42a)

Hot water usage for baths

	26.1855	25.7966	25.2490	24.2393	23.4832	22.6448	22.1919	22.7357	23.3278	24.2249	25.2555	26.0970 (42b)

Hot water usage for other uses

	36.8542	35.5141	34.1739	32.8337	31.4936	30.1534	30.1534	31.4936	32.8337	34.1739	35.5141	36.8542 (42c)

Average daily hot water use (litres/day) 113.6581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	123.6452	121.0053	117.7903	112.9011	108.9309	104.6625	103.0218	106.2229	109.5990	114.0801	119.0447	123.3244	(44)
Energy conte	195.8237	172.3100	181.0394	154.5560	146.6419	128.6948	124.5960	131.5262	135.1466	154.8056	169.6010	193.0962	(45)
Energy content (annual)										Total = Sum(45)m =		1887.8373	
Distribution loss (46)m = 0.15 x (45)m													
	29.3736	25.8465	27.1559	23.1834	21.9963	19.3042	18.6894	19.7289	20.2720	23.2208	25.4401	28.9644	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
										Total per year (kWh/year) = Sum(64)m =		2232.7623	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	65.1114	57.2931	60.1956	51.3899	48.7584	42.7910	41.4282	43.7325	44.9362	51.4729	56.3923	64.2045	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	130.2072	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.2960	19.8031	16.1050	12.1925	9.1140	7.6945	8.3141	10.8070	14.5052	18.4176	21.4961	22.9157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	283.7322	286.6764	279.2570	263.4619	243.5235	224.7842	212.2652	209.3209	216.7403	232.5354	252.4738	271.2131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	50.1908	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	-86.8048	(71)
Water heating gains (Table 5)													
	87.5153	85.2575	80.9081	71.3748	65.5355	59.4320	55.6830	58.7802	62.4114	69.1840	78.3227	86.2964	(72)
Total internal gains													
	487.1367	485.3303	469.8633	440.6225	411.7663	385.5039	369.8555	372.5014	387.2502	413.7303	445.8859	474.0185	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.9200	12.7650	0.3300	0.0000	0.7700	25.6893	(74)
East	11.4100	23.8018	0.3100	0.0000	0.7700	64.8257	(76)

Solar gains	90.5150	154.0643	254.6067	387.9628	476.7988	523.6188	490.5479	421.5342	318.8010	196.5641	110.9257	75.1007	(83)
Total gains	577.6517	639.3946	724.4699	828.5853	888.5651	909.1227	860.4034	794.0356	706.0512	610.2944	556.8116	549.1191	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.7892	62.0993	62.0993	62.5703	62.4125	63.2096	63.2096	63.3715	63.2096	62.5703	62.7289	62.2555	
alpha	5.1193	5.1400	5.1400	5.1714	5.1608	5.2140	5.2140	5.2248	5.2140	5.1714	5.1819	5.1504	
util living area													
	0.9804	0.9655	0.9180	0.7885	0.5913	0.3770	0.2537	0.2824	0.5498	0.8542	0.9614	0.9840	(86)
MIT	20.0879	20.2603	20.5506	20.8409	20.9687	20.9976	20.9998	20.9996	20.9840	20.7960	20.4053	20.0543	(87)
Th 2	20.0741	20.0783	20.0783	20.0846	20.0825	20.0931	20.0931	20.0952	20.0931	20.0846	20.0868	20.0804	(88)
util rest of house													
	0.9750	0.9564	0.8976	0.7462	0.5310	0.3120	0.1840	0.2074	0.4720	0.8112	0.9494	0.9795	(89)
MIT 2	19.0405	19.2583	19.6103	19.9406	20.0606	20.0920	20.0930	20.0951	20.0844	19.9032	19.4483	19.0033	(90)
Living area fraction										fLA = Living area / (4) =		0.3605	(91)
MIT	19.4181	19.6195	19.9493	20.2652	20.3880	20.4185	20.4199	20.4212	20.4087	20.2251	19.7933	19.3822	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4181	19.6195	19.9493	20.2652	20.3880	20.4185	20.4199	20.4212	20.4087	20.2251	19.7933	19.3822	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9509	0.8943	0.7550	0.5515	0.3354	0.2092	0.2344	0.4996	0.8184	0.9447	0.9751	(94)
Useful gains	560.4344	607.9751	647.9200	625.6022	490.0697	304.9527	179.9590	186.1515	352.7538	499.4863	526.0029	535.4278	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	969.3290	937.6403	845.3416	692.9583	501.8712	305.6436	179.9998	186.2245	357.9401	583.3092	786.4426	959.6576	(97)
Space heating kWh	304.2176	221.5350	146.8817	48.4964	8.7803	0.0000	0.0000	0.0000	0.0000	62.3642	187.5166	315.6270	(98a)
Space heating requirement - total per year (kWh/year)												1295.4189	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	304.2176	221.5350	146.8817	48.4964	8.7803	0.0000	0.0000	0.0000	0.0000	62.3642	187.5166	315.6270	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1295.4189	
Space heating per m2											(98c) / (4) =	19.3462	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	304.2176	221.5350	146.8817	48.4964	8.7803	0.0000	0.0000	0.0000	0.0000	62.3642	187.5166	315.6270	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	304.2176	221.5350	146.8817	48.4964	8.7803	0.0000	0.0000	0.0000	0.0000	62.3642	187.5166	315.6270	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	225.1187	198.7700	210.3344	182.9060	175.9369	157.0448	153.8910	160.8212	163.4966	184.1006	197.9510	222.3912	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	62.2451	54.9597	58.1572	50.5733	48.6464	43.4227	42.5507	44.4669	45.2066	50.9036	54.7332	61.4909	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.7828	8.8361	9.7828	9.4672	9.7828	9.4672	9.7828	9.7828	9.4672	9.7828	9.4672	9.7828	(231)
Lighting	19.5156	15.6561	14.0966	10.3278	7.9775	6.5177	7.2773	9.4593	12.2867	16.1209	18.2085	20.0580	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1295.4189	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	617.3565	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	115.1846	(230a)
Total electricity for the above, kWh/year	115.1846	(231)
Electricity for lighting (calculated in Appendix L)	157.5018	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2185.4618	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1295.4189	27.6700	358.4424	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	617.3565	27.6700	170.8225	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	115.1846	27.6700	31.8716	(249)
Energy for lighting	157.5018	27.6700	43.5808	(250)
Additional standing charges			0.0000	(251)
Total energy cost			604.7173	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4189	0.1574	203.8437	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	617.3565	0.1411	87.1309	(264)
Space and water heating			290.9746	(265)
Pumps, fans and electric keep-hot	115.1846	0.1387	15.9775	(267)
Energy for lighting	157.5018	0.1443	22.7324	(268)
Total CO2, kg/year			329.6845	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4189	1.5825	2050.0406	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	617.3565	1.5219	939.5420	(278)
Space and water heating			2989.5826	(279)
Pumps, fans and electric keep-hot	115.1846	1.5128	174.2513	(281)
Energy for lighting	157.5018	1.5338	241.5815	(282)
Total Primary energy kWh/year			3405.4154	(286)

Summary for Input Data

Plot Reference	P-18	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-18
Plot Address	Flat 14, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.16	**TER**	14.95
Environmental	97 A	**% DER < TER**			65.48
CO_2 Emissions (t/year)	0.22	**DFEE**	36.25	**TFEE**	36.64
Compliance Check	See BREL	**% DFEE < TFEE**			1.06
% DPER < TPER	32.92	**DPER**	53.43	**TPER**	79.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	264.11	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	16.87 m	52.20 m²	2.40 m

8.0 Living Area	23.54	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	25.50	15.17	0.00	None	10.33	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	20.99	18.93	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	37.72	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	87.45

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	52.20	52.20	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Summary for Input Data

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	46.05

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Exposed Floor	Exposed Floor - Solid	Lowest occupied	Other	0.14	Garage Single 2 Inside	0.55	0.00	5.80

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	46.40

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-RED	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	South	2.06	
Patio Door	Window-RED	Brickwork	East	5.42	
East	Window-RED	Brickwork	East	4.91	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	12.87	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	2.75	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.75	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	5.50	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	13.67	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	5.31	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	18.49	0.02	0.02	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.00	0.33	0.33	Abbey Calculated	No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	13.67	0.10	0.10	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	5.50	0.03	0.03	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value	0.06	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0

Summary for Input Data

Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.83	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	6
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No

Summary for Input Data

Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-18	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-18
Plot Address	Flat 14, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.16	**TER**	14.95
Environmental	97 A	**% DER < TER**			65.48
CO_2 Emissions (t/year)	0.22	**DFEE**	36.25	**TFEE**	36.64
Compliance Check	See BREL	**% DFEE < TFEE**			1.06
% DPER < TPER	32.92	**DPER**	53.43	**TPER**	79.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		52.2000 (1b)	x	2.4000 (2b)	=	125.2800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.2000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	125.2800	(5)

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2. Ventilation rate

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		m3 per hour		
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.8300	(17)
Infiltration rate			0.1415	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1203	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1534	0.1503	0.1473	0.1323	0.1293	0.1143	0.1143	0.1113	0.1203	0.1293	0.1353	0.1413	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

Effective ac	0.2894	0.2863	0.2833	0.2683	0.2653	0.2503	0.2503	0.2473	0.2563	0.2653	0.2713	0.2773	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			10.3300	1.2357	12.7652			(27)
Exposed Floor			5.8000	0.1300	0.7539	0.0000	0.0000	(28b)
Brickwork	25.5000	10.3300	15.1700	0.2100	3.1857	110.0000	1668.7000	(29a)
Communal Wall	20.9900	2.0600	18.9300	0.2200	4.1646	110.0000	2082.3000	(29a)
Cold Roof	52.2000		52.2000	0.0900	4.6980	9.0000	469.8000	(30)
Total net area of external elements Aum(A, m2)			104.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0395			(33)
Main dwelling								
Party Wall 1			37.7200	0.0000	0.0000	110.0000	4149.2001	(32)
Party Floor 1			46.4000			70.0000	3248.0000	(32d)
Party Ceiling 1			46.0500			30.0000	1381.5000	(32b)
Internal Wall 1			87.4500			9.0000	787.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13786.5501 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 264.1102 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.8700	0.0380	0.4891
E16 Corner (normal)	2.7500	0.0540	0.1485
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0970	-0.2667
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6700	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
P4 Party wall - Roof (insulation at ceiling level)	13.6700	0.1010	1.3807
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7563 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.7958 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.9624	11.8381	11.7138	11.0923	10.9680	10.3464	10.3464	10.2221	10.5950	10.9680	11.2166	11.4652	(38)
Heat transfer coeff	46.7582	46.6339	46.5096	45.8880	45.7637	45.1422	45.1422	45.0179	45.3908	45.7637	46.0124	46.2610	(39)

Average = Sum(39)m / 12 = 45.8570

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8958	0.8934	0.8910	0.8791	0.8767	0.8648	0.8648	0.8624	0.8696	0.8767	0.8815	0.8862	(40)
HLP (average)												0.8785	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7550 (42)

Hot water usage for mixer showers

53.6446	52.8384	51.6637	49.4160	47.7573	45.9075	44.8560	46.0219	47.2999	49.2860	51.5820	53.4391	(42a)

Hot water usage for baths

23.1922	22.8477	22.3627	21.4684	20.7987	20.0562	19.6551	20.1367	20.6611	21.4557	22.3684	23.1138	(42b)

Hot water usage for other uses

32.6027	31.4171	30.2316	29.0460	27.8605	26.6749	26.6749	27.8605	29.0460	30.2316	31.4171	32.6027	(42c)

Average daily hot water use (litres/day) 100.6001 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.4394	107.1033	104.2579	99.9304	96.4164	92.6385	91.1860	94.0191	97.0070	100.9733	105.3675	109.1555	(44)
Energy conte	173.3253	152.5136	160.2405	136.7997	129.7950	113.9099	110.2816	116.4152	119.6194	137.0198	150.1154	170.9111	(45)

Energy content (annual) Total = Sum(45)m = 1670.9464

Distribution loss (46)m = 0.15 x (45)m

25.9988	22.8770	24.0361	20.5200	19.4693	17.0865	16.5422	17.4623	17.9429	20.5530	22.5173	25.6367	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(64)

Total per year (kWh/year) = Sum(64)m = 2015.8714 (64)

12Total per year (kWh/year) 2016 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.6307	50.7108	53.2800	45.4859	43.1568	37.8750	36.6686	38.7081	39.7734	45.5591	49.9134	56.8279	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.7751	86.1081	77.7751	80.3676	77.7751	80.3676	77.7751	77.7751	80.3676	77.7751	80.3676	77.7751	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.9446	154.5317	150.5323	142.0180	131.2703	121.1690	114.4206	112.8335	116.8330	125.3472	136.0949	146.1963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	(71)
Water heating gains (Table 5)	77.4606	75.4625	71.6129	63.1748	58.0065	52.6042	49.2858	52.0270	55.2409	61.2353	69.3241	76.3816	(72)
Total internal gains	357.5048	365.4268	349.2448	334.8850	316.3764	303.4653	290.8060	291.9601	301.7660	313.6822	335.1112	349.6776	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.3100	0.0000	0.7700	48.4284	(76)

Solar gains	48.4284	94.7362	156.0170	227.5416	278.8607	285.4636	271.7730	233.4490	181.4543	112.4125	60.3845	39.8252	(83)
Total gains	405.9332	460.1630	505.2618	562.4266	595.2372	588.9289	562.5790	525.4091	483.2202	426.0946	395.4957	389.5027	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.9021	82.1204	82.3399	83.4552	83.6819	84.8341	84.8341	85.0684	84.3695	83.6819	83.2298	82.7825	
alpha	6.4601	6.4747	6.4893	6.5637	6.5788	6.6556	6.6556	6.6712	6.6246	6.5788	6.5487	6.5188	
util living area	0.9929	0.9833	0.9565	0.8621	0.6907	0.4884	0.3528	0.3937	0.6348	0.9109	0.9832	0.9944	(86)
MIT	20.2228	20.3861	20.6065	20.8548	20.9701	20.9973	20.9997	20.9995	20.9866	20.8187	20.4829	20.1967	(87)
Th 2	20.1711	20.1731	20.1752	20.1853	20.1874	20.1975	20.1975	20.1996	20.1935	20.1874	20.1833	20.1792	(88)
util rest of house	0.9907	0.9783	0.9438	0.8294	0.6383	0.4282	0.2886	0.3254	0.5662	0.8804	0.9771	0.9927	(89)
MIT 2	19.2738	19.4810	19.7547	20.0492	20.1649	20.1962	20.1975	20.1994	20.1856	20.0188	19.6129	19.2470	(90)
Living area fraction										fLA = Living area / (4) =		0.4510	(91)
MIT	19.7018	19.8892	20.1388	20.4125	20.5280	20.5575	20.5592	20.5602	20.5468	20.3796	20.0052	19.6753	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7018	19.8892	20.1388	20.4125	20.5280	20.5575	20.5592	20.5602	20.5468	20.3796	20.0052	19.6753	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9891	0.9761	0.9432	0.8391	0.6607	0.4553	0.3176	0.3562	0.5968	0.8884	0.9755	0.9913	(94)
Useful gains	401.5080	449.1866	476.5469	471.9362	393.2958	268.1378	178.6700	187.1596	288.3717	378.5320	385.8195	386.1088	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	720.1598	699.0031	634.3366	528.2878	404.0029	268.9323	178.7291	187.2833	292.6258	447.5490	593.7987	715.9002	(97)
Space heating kWh	237.0769	167.8767	117.3956	40.5731	7.9661	0.0000	0.0000	0.0000	0.0000	51.3487	149.7450	245.3648	(98a)
Space heating requirement - total per year (kWh/year)												1017.3469	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	237.0769	167.8767	117.3956	40.5731	7.9661	0.0000	0.0000	0.0000	0.0000	51.3487	149.7450	245.3648	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1017.3469	
Space heating per m2											(98c) / (4) =	19.4894	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	237.0769	167.8767	117.3956	40.5731	7.9661	0.0000	0.0000	0.0000	0.0000	51.3487	149.7450	245.3648	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	237.0769	167.8767	117.3956	40.5731	7.9661	0.0000	0.0000	0.0000	0.0000	51.3487	149.7450	245.3648	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	56.0243	49.4860	52.4064	45.6637	43.9882	39.3347	38.5928	40.2887	40.9134	45.9859	49.3455	55.3568	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.6264	6.8883	7.6264	7.3804	7.6264	7.3804	7.6264	7.6264	7.3804	7.6264	7.3804	7.6264	(231)
Lighting	15.8298	12.6993	11.4343	8.3772	6.4708	5.2867	5.9029	7.6728	9.9662	13.0762	14.7696	16.2698	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1017.3469	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	557.3864	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	89.7944	(230a)
Total electricity for the above, kWh/year	89.7944	(231)
Electricity for lighting (calculated in Appendix L)	127.7557	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1792.2834	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1017.3469	0.1572	159.9082	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	557.3864	0.1411	78.6404	(264)
Space and water heating			238.5486	(265)
Pumps, fans and electric keep-hot	89.7944	0.1387	12.4556	(267)
Energy for lighting	127.7557	0.1443	18.4391	(268)
Total CO2, kg/year			269.4433	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1017.3469	1.5819	1609.3198	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	557.3864	1.5217	848.1752	(278)
Space and water heating			2457.4950	(279)
Pumps, fans and electric keep-hot	89.7944	1.5128	135.8410	(281)
Energy for lighting	127.7557	1.5338	195.9559	(282)
Total Primary energy kWh/year			2789.2920	(286)
Dwelling Primary energy Rate (DPER)			53.4300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.2000	(1b)	x 2.4000	(2b) =	125.2800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	125.2800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1596	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4096	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3482	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4439	0.4352	0.4265	0.3830	0.3743	0.3308	0.3308	0.3221	0.3482	0.3743	0.3917	0.4091	(22b)
Effective ac	0.5985	0.5947	0.5910	0.5734	0.5701	0.5547	0.5547	0.5519	0.5606	0.5701	0.5767	0.5837	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.3300	1.1450	11.8282			(27)
Exposed Floor			5.8000	0.1300	0.7540			(28b)
Brickwork	25.5000	10.3300	15.1700	0.1800	2.7306			(29a)
Communal Wall	20.9900	2.0600	18.9300	0.1800	3.4074			(29a)
Cold Roof	52.2000		52.2000	0.1100	5.7420			(30)
Total net area of external elements Aum(A, m2)			104.4900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.5222			(33)
Main dwelling								
Party Wall 1			37.7200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 264.1102 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	12.8700	0.0700	0.9009	
E16 Corner (normal)	2.7500	0.0900	0.2475	
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0900	-0.2475	
E18 Party wall between dwellings	5.5000	0.0600	0.3300	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6700	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655	
E4 Jamb	18.4900	0.0500	0.9245	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.0200	0.0800	
P4 Party wall - Roof (insulation at ceiling level)	13.6700	0.1200	1.6404	
E25 Staggered party wall between dwellings	5.5000	0.0600	0.3300	
E5 Ground floor (normal)	24.5000	0.1600	3.9200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3913 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.9135 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.7453	24.5871	24.4320	23.7037	23.5674	22.9330	22.9330	22.8156	23.1774	23.5674	23.8431	24.1313	(38)
Heat transfer coeff	59.6589	59.5007	59.3456	58.6172	58.4810	57.8466	57.8466	57.7291	58.0909	58.4810	58.7566	59.0448	(39)

Average = Sum(39)m / 12 = 58.6166

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1429	1.1399	1.1369	1.1229	1.1203	1.1082	1.1082	1.1059	1.1129	1.1203	1.1256	1.1311	(40)
HLP (average)												1.1229	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7550 (42)

Hot water usage for mixer showers

53.6446	52.8384	51.6637	49.4160	47.7573	45.9075	44.8560	46.0219	47.2999	49.2860	51.5820	53.4391	(42a)

Hot water usage for baths

23.1922	22.8477	22.3627	21.4684	20.7987	20.0562	19.6551	20.1367	20.6611	21.4557	22.3684	23.1138	(42b)

Hot water usage for other uses

32.6027	31.4171	30.2316	29.0460	27.8605	26.6749	26.6749	27.8605	29.0460	30.2316	31.4171	32.6027	(42c)

Average daily hot water use (litres/day) 100.6001 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.4394	107.1033	104.2579	99.9304	96.4164	92.6385	91.1860	94.0191	97.0070	100.9733	105.3675	109.1555	(44)
Energy conte	173.3253	152.5136	160.2405	136.7997	129.7950	113.9099	110.2816	116.4152	119.6194	137.0198	150.1154	170.9111	(45)
Energy content (annual)										Total = Sum(45)m =		1670.9464	
Distribution loss (46)m = 0.15 x (45)m	25.9988	22.8770	24.0361	20.5200	19.4693	17.0865	16.5422	17.4623	17.9429	20.5530	22.5173	25.6367	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

219.9202	194.5993	206.8354	181.8915	176.3899	159.0017	156.8765	163.0101	164.7112	183.6147	195.2072	217.5060	(62)
WWHRS -24.5241	-21.6893	-22.7118	-18.8062	-17.5267	-14.9978	-14.0580	-14.9493	-15.5173	-18.2931	-20.7239	-24.0699	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

195.3961	172.9100	184.1237	163.0853	158.8632	144.0040	142.8185	148.0609	149.1940	165.3215	174.4833	193.4361	(64)
								Total per year (kWh/year) = Sum(64)m =			1991.6964	(64)

12Total per year (kWh/year) 1992 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

94.9066	84.3794	90.5559	81.5594	80.4328	73.9485	73.9445	75.9840	75.8469	82.8350	85.9868	94.1039	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.7751	86.1081	77.7751	80.3676	77.7751	80.3676	77.7751	77.7751	80.3676	77.7751	80.3676	77.7751	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.9446	154.5317	150.5323	142.0180	131.2703	121.1690	114.4206	112.8335	116.8330	125.3472	136.0949	146.1963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	(71)
Water heating gains (Table 5)													
	127.5626	125.5645	121.7149	113.2769	108.1086	102.7063	99.3878	102.1290	105.3429	111.3374	119.4261	126.4837	(72)
Total internal gains													
	410.6068	418.5289	402.3468	387.9870	369.4785	353.5673	340.9081	342.0622	351.8680	366.7842	388.2132	402.7796	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.6300	0.7000	0.7700	62.0040	(76)

Solar gains	62.0040	121.2929	199.7521	291.3266	357.0317	365.4855	347.9571	298.8900	232.3200	143.9243	77.3117	50.9890	(83)
Total gains	472.6108	539.8218	602.0990	679.3136	726.5102	719.0528	688.8651	640.9521	584.1880	510.7085	465.5249	453.7686	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.1916	64.3623	64.5304	65.3323	65.4845	66.2027	66.2027	66.3374	65.9242	65.4845	65.1773	64.8591	
alpha	5.2794	5.2908	5.3020	5.3555	5.3656	5.4135	5.4135	5.4225	5.3949	5.3656	5.3452	5.3239	
util living area													
	0.9897	0.9784	0.9495	0.8603	0.7013	0.5079	0.3684	0.4123	0.6551	0.9065	0.9781	0.9915	(86)
MIT	19.9596	20.1536	20.4309	20.7533	20.9321	20.9901	20.9985	20.9974	20.9642	20.7129	20.2865	19.9309	(87)
Th 2	19.9660	19.9684	19.9708	19.9821	19.9843	19.9942	19.9942	19.9960	19.9904	19.9843	19.9800	19.9755	(88)
util rest of house													
	0.9863	0.9717	0.9340	0.8232	0.6395	0.4313	0.2848	0.3234	0.5717	0.8716	0.9700	0.9887	(89)
MIT 2	18.7827	19.0282	19.3715	19.7531	19.9339	19.9893	19.9938	19.9952	19.9696	19.7214	19.2067	18.7536	(90)
Living area fraction										fLA = Living area / (4) =		0.4510	(91)
MIT	19.3134	19.5357	19.8492	20.2041	20.3841	20.4406	20.4469	20.4472	20.4181	20.1685	19.6936	19.2845	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3134	19.5357	19.8492	20.2041	20.3841	20.4406	20.4469	20.4472	20.4181	20.1685	19.6936	19.2845	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9835	0.9682	0.9319	0.8320	0.6647	0.4657	0.3226	0.3635	0.6082	0.8787	0.9671	0.9863	(94)
Useful gains	464.8335	522.6299	561.0993	565.1785	482.9189	334.8324	222.1965	233.0138	355.3092	448.7779	450.2155	447.5402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	895.6848	870.8350	792.2172	662.6177	507.8520	337.8577	222.5288	233.6386	367.0240	559.5766	739.9598	890.6615	(97)
Space heating kWh													
	320.5534	233.9939	171.9517	70.1563	18.5502	0.0000	0.0000	0.0000	0.0000	82.4342	208.6158	329.6822	(98a)
Space heating requirement - total per year (kWh/year)												1435.9378	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	320.5534	233.9939	171.9517	70.1563	18.5502	0.0000	0.0000	0.0000	0.0000	82.4342	208.6158	329.6822	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1435.9378	
Space heating per m2											(98c) / (4) =	27.5084	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	320.5534	233.9939	171.9517	70.1563	18.5502	0.0000	0.0000	0.0000	0.0000	82.4342	208.6158	329.6822	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	347.2951	253.5145	186.2966	76.0089	20.0978	0.0000	0.0000	0.0000	0.0000	89.3112	226.0193	357.1855	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.3961	172.9100	184.1237	163.0853	158.8632	144.0040	142.8185	148.0609	149.1940	165.3215	174.4833	193.4361	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1626	84.7388	83.9067	82.3092	80.6547	79.8000	79.8000	79.8000	79.8000	82.5849	84.4615	85.2449	(217)
Fuel for water heating, kWh/month													
	229.4390	204.0505	219.4386	198.1373	196.9670	180.4561	178.9705	185.5399	186.9599	200.1837	206.5833	226.9179	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1601	12.9642	11.6729	8.5520	6.6058	5.3970	6.0261	7.8329	10.1742	13.3491	15.0778	16.6093	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1218	-20.9963	-31.8161	-37.7886	-42.5446	-40.3929	-39.9209	-36.8015	-31.6030	-24.9016	-15.9134	-12.0871	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9860	-10.7288	-21.7723	-33.3604	-44.7514	-45.1803	-44.6286	-37.4763	-27.0774	-15.5361	-6.7200	-3.9237	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1555.7289	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2413.6437	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.4214	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-645.0290	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3540.7651	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1555.7289	0.2100	326.7031	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2413.6437	0.2100	506.8652	(264)
Space and water heating			833.5683	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.4214	0.1443	18.8238	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-348.8877	0.1335	-46.5642	
PV Unit electricity exported	-296.1412	0.1253	-37.1143	
Total			-83.6785	(269)
Total CO2, kg/year			780.6428	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1555.7289	1.1300	1757.9737	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2413.6437	1.1300	2727.4174	(278)
Space and water heating			4485.3911	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.4214	1.5338	200.0447	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-348.8877	1.4932	-520.9589	
PV Unit electricity exported	-296.1412	0.4600	-136.2273	
Total			-657.1862	(283)
Total Primary energy kWh/year			4158.3504	(286)
Target Primary Energy Rate (TPER)			79.6600	(287)

Full SAP Calculation Printout

Plot Reference	P-18	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-18
Plot Address	Flat 14, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.16	**TER**	14.95
Environmental	97 A	**% DER < TER**			65.48
CO_2 Emissions (t/year)	0.22	**DFEE**	36.25	**TFEE**	36.64
Compliance Check	See BREL	**% DFEE < TFEE**			1.06
% DPER < TPER	32.92	**DPER**	53.43	**TPER**	79.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.2000 (1b)	x	2.4000 (2b)	=	125.2800	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.2000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	125.2800	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1596	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8300	(17)
Infiltration rate		0.3011	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2560	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3264	0.3200	0.3136	0.2816	0.2752	0.2432	0.2432	0.2368	0.2560	0.2752	0.2880	0.3008	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5533	0.5512	0.5492	0.5396	0.5379	0.5296	0.5296	0.5280	0.5328	0.5379	0.5415	0.5452	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			10.3300	1.2357	12.7652			(27)
Exposed Floor			5.8000	0.1300	0.7539	0.0000	0.0000	(28b)
Brickwork	25.5000	10.3300	15.1700	0.2100	3.1857	110.0000	1668.7000	(29a)
Communal Wall	20.9900	2.0600	18.9300	0.2200	4.1646	110.0000	2082.3000	(29a)
Cold Roof	52.2000		52.2000	0.0900	4.6980	9.0000	469.8000	(30)
Total net area of external elements Aum(A, m2)			104.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0395			(33)
Main dwelling								
Party Wall 1			37.7200	0.0000	0.0000	110.0000	4149.2001	(32)
Party Floor 1			46.4000			70.0000	3248.0000	(32d)
Party Ceiling 1			46.0500			30.0000	1381.5000	(32b)
Internal Wall 1			87.4500			9.0000	787.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13786.5501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		264.1102 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	12.8700	0.0380	0.4891	
E16 Corner (normal)	2.7500	0.0540	0.1485	
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0970	-0.2667	
E18 Party wall between dwellings	5.5000	0.0380	0.2090	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6700	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655	
E4 Jamb	18.4900	0.0160	0.2958	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200	
P4 Party wall - Roof (insulation at ceiling level)	13.6700	0.1010	1.3807	
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.7563 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	34.7958 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.8729	22.7875	22.7036	22.3100	22.2364	21.8935	21.8935	21.8301	22.0256	22.2364	22.3854	22.5411	(38)
Heat transfer coeff	57.6687	57.5832	57.4994	57.1058	57.0322	56.6893	56.6893	56.6258	56.8214	57.0322	57.1811	57.3369	(39)
Average = Sum(39)m / 12 =												57.1054	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1048	1.1031	1.1015	1.0940	1.0926	1.0860	1.0860	1.0848	1.0885	1.0926	1.0954	1.0984	(40)
HLP (average)												1.0940	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7550 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.1922	22.8477	22.3627	21.4684	20.7987	20.0562	19.6551	20.1367	20.6611	21.4557	22.3684	23.1138	(42b)

Hot water usage for other uses

32.6027	31.4171	30.2316	29.0460	27.8605	26.6749	26.6749	27.8605	29.0460	30.2316	31.4171	32.6027	(42c)

Average daily hot water use (litres/day) 51.1416 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.7948	54.2648	52.5942	50.5144	48.6592	46.7311	46.3300	47.9972	49.7071	51.6872	53.7855	55.7164	(44)
Energy conte	88.3654	77.2724	80.8354	69.1516	65.5046	57.4613	56.0321	59.4305	61.2939	70.1391	76.6274	87.2384	(45)
Energy content (annual)										Total = Sum(45)m =		849.3521	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	75.1106	65.6815	68.7101	58.7789	55.6789	48.8421	47.6273	50.5159	52.0998	59.6182	65.1333	74.1527	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	75.1106	65.6815	68.7101	58.7789	55.6789	48.8421	47.6273	50.5159	52.0998	59.6182	65.1333	74.1527	(64)
									Total per year (kWh/year) = Sum(64)m =			721.9493	(64)
12Total per year (kWh/year)												722	(64)
Electric shower(s)	42.9604	38.2781	41.7982	39.8875	40.6360	38.7628	40.0548	40.6360	39.8875	41.7982	41.0122	42.9604	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			488.6718	(64a)
Heat gains from water heating, kWh/month	29.5177	25.9899	27.6271	24.6666	24.0787	21.9012	21.9205	22.7880	22.9968	25.3541	26.5364	29.2783	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.7751	86.1081	77.7751	80.3676	77.7751	80.3676	77.7751	77.7751	80.3676	77.7751	80.3676	77.7751	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.9446	154.5317	150.5323	142.0180	131.2703	121.1690	114.4206	112.8335	116.8330	125.3472	136.0949	146.1963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	(71)
Water heating gains (Table 5)	39.6744	38.6754	37.1332	34.2592	32.3639	30.4184	29.4631	30.6290	31.9400	34.0781	36.8561	39.3525	(72)
Total internal gains	319.7186	328.6398	314.7651	305.9693	290.7338	281.2794	270.9833	270.5622	278.4651	286.5249	302.6431	312.6484	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.3100	0.0000	0.7700	48.4284	(76)

Solar gains	48.4284	94.7362	156.0170	227.5416	278.8607	285.4636	271.7730	233.4490	181.4543	112.4125	60.3845	39.8252	(83)
Total gains	368.1470	423.3760	470.7821	533.5109	569.5945	566.7430	542.7563	504.0111	459.9194	398.9374	363.0276	352.4736	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.4068	66.5054	66.6024	67.0614	67.1480	67.5541	67.5541	67.6299	67.3971	67.1480	66.9731	66.7911	
alpha	5.4271	5.4337	5.4402	5.4708	5.4765	5.5036	5.5036	5.5087	5.4931	5.4765	5.4649	5.4527	
util living area	0.9966	0.9923	0.9801	0.9319	0.8139	0.6192	0.4561	0.5101	0.7714	0.9596	0.9925	0.9974	(86)
MIT	19.8187	19.9951	20.2618	20.6152	20.8674	20.9764	20.9963	20.9933	20.9259	20.5824	20.1376	19.7865	(87)
Th 2	19.9969	19.9983	19.9996	20.0058	20.0069	20.0123	20.0123	20.0133	20.0102	20.0069	20.0046	20.0021	(88)
util rest of house	0.9955	0.9896	0.9730	0.9084	0.7585	0.5327	0.3556	0.4043	0.6899	0.9407	0.9894	0.9964	(89)
MIT 2	18.9294	19.1055	19.3688	19.7089	19.9241	20.0026	20.0114	20.0116	19.9734	19.6868	19.2529	18.9015	(90)
Living area fraction										fLA = Living area / (4) =		0.4510	(91)
MIT	19.3305	19.5067	19.7715	20.1176	20.3495	20.4417	20.4555	20.4543	20.4029	20.0906	19.6518	19.3006	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3305	19.5067	19.7715	20.1176	20.3495	20.4417	20.4555	20.4543	20.4029	20.0906	19.6518	19.3006	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9879	0.9710	0.9114	0.7790	0.5713	0.4011	0.4522	0.7244	0.9426	0.9879	0.9956	(94)
Useful gains	366.1082	418.2693	457.1441	486.2561	443.6918	323.7850	217.6916	227.9254	333.1581	376.0340	358.6478	350.9133	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	866.7880	841.0998	763.1043	640.5889	493.2973	331.1632	218.5685	229.5784	358.1420	541.2714	717.7282	865.8227	(97)
Space heating kWh	372.5057	284.1421	227.6344	111.1197	36.9065	0.0000	0.0000	0.0000	0.0000	122.9366	258.5379	383.0926	(98a)
Space heating requirement - total per year (kWh/year)												1796.8756	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	372.5057	284.1421	227.6344	111.1197	36.9065	0.0000	0.0000	0.0000	0.0000	122.9366	258.5379	383.0926	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1796.8756	
Space heating per m2											(98c) / (4) =	34.4229	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	532.8796	419.5010	430.3564	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9095	0.9557	0.9354	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	484.6583	400.9289	402.5644	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	634.1155	607.6341	563.8417	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	107.6092	153.7887	119.9903	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.9023	38.4472	29.9976	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												95.3470	(107)
Energy for space heating												34.4229	(99)
Energy for space cooling												1.8266	(108)
Total												36.2495	(109)
Fabric Energy Efficiency (DFEE)												36.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.2000 (1b)	x	2.4000 (2b)	=	125.2800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.2000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	125.2800	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) =	0.1596	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4096	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3482	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4439	0.4352	0.4265	0.3830	0.3743	0.3308	0.3308	0.3221	0.3482	0.3743	0.3917	0.4091	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5985	0.5947	0.5910	0.5734	0.5701	0.5547	0.5547	0.5519	0.5606	0.5701	0.5767	0.5837	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.3300	1.1450	11.8282			(27)
Exposed Floor			5.8000	0.1300	0.7540			(28b)
Brickwork	25.5000	10.3300	15.1700	0.1800	2.7306			(29a)
Communal Wall	20.9900	2.0600	18.9300	0.1800	3.4074			(29a)
Cold Roof	52.2000		52.2000	0.1100	5.7420			(30)
Total net area of external elements Aum(A, m2)			104.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5222			(33)
Main dwelling								
Party Wall 1			37.7200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	264.1102	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.8700	0.0700	0.9009
E16 Corner (normal)	2.7500	0.0900	0.2475
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0900	-0.2475
E18 Party wall between dwellings	5.5000	0.0600	0.3300
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6700	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0500	0.9245
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.0200	0.0800
P4 Party wall - Roof (insulation at ceiling level)	13.6700	0.1200	1.6404
E25 Staggered party wall between dwellings	5.5000	0.0600	0.3300
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3913	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	34.9135	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.7453	24.5871	24.4320	23.7037	23.5674	22.9330	22.9330	22.8156	23.1774	23.5674	23.8431	24.1313	(38)
Heat transfer coeff	59.6589	59.5007	59.3456	58.6172	58.4810	57.8466	57.8466	57.7291	58.0909	58.4810	58.7566	59.0448	(39)
Average = Sum(39)m / 12 =												58.6166	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1429	1.1399	1.1369	1.1229	1.1203	1.1082	1.1082	1.1059	1.1129	1.1203	1.1256	1.1311	(40)
HLP (average)												1.1229	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7550	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	23.1922	22.8477	22.3627	21.4684	20.7987	20.0562	19.6551	20.1367	20.6611	21.4557	22.3684	23.1138	(42b)

Hot water usage for other uses

	32.6027	31.4171	30.2316	29.0460	27.8605	26.6749	26.6749	27.8605	29.0460	30.2316	31.4171	32.6027	(42c)
Average daily hot water use (litres/day)												51.1416	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.7948	54.2648	52.5942	50.5144	48.6592	46.7311	46.3300	47.9972	49.7071	51.6872	53.7855	55.7164	(44)
Energy conte	88.3654	77.2724	80.8354	69.1516	65.5046	57.4613	56.0321	59.4305	61.2939	70.1391	76.6274	87.2384	(45)
Energy content (annual)										Total = Sum(45)m =		849.3521	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	75.1106	65.6815	68.7101	58.7789	55.6789	48.8421	47.6273	50.5159	52.0998	59.6182	65.1333	74.1527	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	75.1106	65.6815	68.7101	58.7789	55.6789	48.8421	47.6273	50.5159	52.0998	59.6182	65.1333	74.1527	(64)
										Total per year (kWh/year) = Sum(64)m =		721.9493	(64)
12Total per year (kWh/year)												722	(64)

Electric shower(s)

	42.9604	38.2781	41.7982	39.8875	40.6360	38.7628	40.0548	40.6360	39.8875	41.7982	41.0122	42.9604	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		488.6718	(64a)

Heat gains from water heating, kWh/month

	29.5177	25.9899	27.6271	24.6666	24.0787	21.9012	21.9205	22.7880	22.9968	25.3541	26.5364	29.2783 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	77.7751	86.1081	77.7751	80.3676	77.7751	80.3676	77.7751	77.7751	80.3676	77.7751	80.3676	77.7751	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	152.9446	154.5317	150.5323	142.0180	131.2703	121.1690	114.4206	112.8335	116.8330	125.3472	136.0949	146.1963	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	(71)

Water heating gains (Table 5)

	39.6744	38.6754	37.1332	34.2592	32.3639	30.4184	29.4631	30.6290	31.9400	34.0781	36.8561	39.3525	(72)

Total internal gains

	319.7186	328.6398	314.7651	305.9693	290.7338	281.2794	270.9833	270.5622	278.4651	286.5249	302.6431	312.6484	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.6300	0.7000	0.7700	62.0040	(76)

Solar gains	62.0040	121.2929	199.7521	291.3266	357.0317	365.4855	347.9571	298.8900	232.3200	143.9243	77.3117	50.9890	(83)
Total gains	381.7226	449.9327	514.5172	597.2959	647.7655	646.7649	618.9404	569.4521	510.7851	430.4492	379.9548	363.6375	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.1916	64.3623	64.5304	65.3323	65.4845	66.2027	66.2027	66.3374	65.9242	65.4845	65.1773	64.8591	
alpha	5.2794	5.2908	5.3020	5.3555	5.3656	5.4135	5.4135	5.4225	5.3949	5.3656	5.3452	5.3239	
util living area	0.9961	0.9902	0.9726	0.9053	0.7611	0.5601	0.4092	0.4623	0.7267	0.9486	0.9910	0.9970	(86)
MIT	19.7874	19.9908	20.2905	20.6671	20.8995	20.9843	20.9976	20.9955	20.9414	20.6050	20.1309	19.7586	(87)
Th 2	19.9660	19.9684	19.9708	19.9821	19.9843	19.9942	19.9942	19.9960	19.9904	19.9843	19.9800	19.9755	(88)
util rest of house	0.9947	0.9869	0.9633	0.8758	0.7008	0.4776	0.3168	0.3636	0.6423	0.9256	0.9873	0.9959	(89)
MIT 2	18.8738	19.0772	19.3722	19.7323	19.9240	19.9879	19.9936	19.9949	19.9625	19.6871	19.2265	18.8526	(90)
Living area fraction									fLA = Living area / (4) =			0.4510	(91)
MIT	19.2858	19.4892	19.7863	20.1539	20.3639	20.4372	20.4464	20.4461	20.4039	20.1010	19.6344	19.2612	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2858	19.4892	19.7863	20.1539	20.3639	20.4372	20.4464	20.4461	20.4039	20.1010	19.6344	19.2612	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9849	0.9612	0.8813	0.7245	0.5146	0.3586	0.4082	0.6787	0.9287	0.9857	0.9949	(94)
Useful gains	379.2639	443.1267	494.5707	526.4163	469.3171	332.8044	221.9381	232.4775	346.6576	399.7546	374.5238	361.7917	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	894.0334	868.0659	788.4839	659.6701	506.6736	337.6638	222.4993	233.5789	366.2005	555.6288	736.4774	889.2835	(97)
Space heating kWh	382.9885	285.5592	218.6714	95.9427	27.7932	0.0000	0.0000	0.0000	0.0000	115.9704	260.6066	392.4539	(98a)
Space heating requirement - total per year (kWh/year)												1779.9860	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	382.9885	285.5592	218.6714	95.9427	27.7932	0.0000	0.0000	0.0000	0.0000	115.9704	260.6066	392.4539	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1779.9860	
Space heating per m2										(98c) / (4) =		34.0993	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	543.7578	428.0647	438.7412	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9383	0.9711	0.9556	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	510.1861	415.7036	419.2419	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	727.6476	696.6805	640.3312	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	156.5722	209.0468	164.4904	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.1431	52.2617	41.1226	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												132.5274	(107)
Energy for space heating												34.0993	(99)
Energy for space cooling												2.5388	(108)
Total												36.6382	(109)
Fabric Energy Efficiency (TFEE)												36.6	(109)

Full SAP Calculation Printout

Plot Reference	P-18	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-18
Plot Address	Flat 14, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.16	**TER**	14.95
Environmental	97 A	**% DER < TER**			65.48
CO_2 Emissions (t/year)	0.22	**DFEE**	36.25	**TFEE**	36.64
Compliance Check	See BREL	**% DFEE < TFEE**			1.06
% DPER < TPER	32.92	**DPER**	53.43	**TPER**	79.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		52.2000 (1b)	x	2.4000 (2b)	=	125.2800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.2000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	125.2800	(5)

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2. Ventilation rate

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		m3 per hour		
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.8300	(17)
Infiltration rate			0.1415	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1203	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1534	0.1503	0.1473	0.1323	0.1293	0.1143	0.1143	0.1113	0.1203	0.1293	0.1353	0.1413	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

Effective ac	0.2894	0.2863	0.2833	0.2683	0.2653	0.2503	0.2503	0.2473	0.2563	0.2653	0.2713	0.2773	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			10.3300	1.2357	12.7652			(27)
Exposed Floor			5.8000	0.1300	0.7539	0.0000	0.0000	(28b)
Brickwork	25.5000	10.3300	15.1700	0.2100	3.1857	110.0000	1668.7000	(29a)
Communal Wall	20.9900	2.0600	18.9300	0.2200	4.1646	110.0000	2082.3000	(29a)
Cold Roof	52.2000		52.2000	0.0900	4.6980	9.0000	469.8000	(30)
Total net area of external elements Aum(A, m2)			104.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0395			(33)
Main dwelling								
Party Wall 1			37.7200	0.0000	0.0000	110.0000	4149.2001	(32)
Party Floor 1			46.4000			70.0000	3248.0000	(32d)
Party Ceiling 1			46.0500			30.0000	1381.5000	(32b)
Internal Wall 1			87.4500			9.0000	787.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13786.5501 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 264.1102 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.8700	0.0380	0.4891
E16 Corner (normal)	2.7500	0.0540	0.1485
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0970	-0.2667
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6700	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
P4 Party wall - Roof (insulation at ceiling level)	13.6700	0.1010	1.3807
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7563 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.7958 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.9624	11.8381	11.7138	11.0923	10.9680	10.3464	10.3464	10.2221	10.5950	10.9680	11.2166	11.4652	(38)
Heat transfer coeff	46.7582	46.6339	46.5096	45.8880	45.7637	45.1422	45.1422	45.0179	45.3908	45.7637	46.0124	46.2610	(39)

Average = Sum(39)m / 12 = 45.8570

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8958	0.8934	0.8910	0.8791	0.8767	0.8648	0.8648	0.8624	0.8696	0.8767	0.8815	0.8862	(40)
HLP (average)												0.8785	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7550 (42)

Hot water usage for mixer showers

53.6446	52.8384	51.6637	49.4160	47.7573	45.9075	44.8560	46.0219	47.2999	49.2860	51.5820	53.4391	(42a)

Hot water usage for baths

23.1922	22.8477	22.3627	21.4684	20.7987	20.0562	19.6551	20.1367	20.6611	21.4557	22.3684	23.1138	(42b)

Hot water usage for other uses

32.6027	31.4171	30.2316	29.0460	27.8605	26.6749	26.6749	27.8605	29.0460	30.2316	31.4171	32.6027	(42c)

Average daily hot water use (litres/day) 100.6001 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.4394	107.1033	104.2579	99.9304	96.4164	92.6385	91.1860	94.0191	97.0070	100.9733	105.3675	109.1555	(44)
Energy conte	173.3253	152.5136	160.2405	136.7997	129.7950	113.9099	110.2816	116.4152	119.6194	137.0198	150.1154	170.9111	(45)

Energy content (annual) Total = Sum(45)m = 1670.9464

Distribution loss (46)m = 0.15 x (45)m

25.9988	22.8770	24.0361	20.5200	19.4693	17.0865	16.5422	17.4623	17.9429	20.5530	22.5173	25.6367	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(64)

Total per year (kWh/year) = Sum(64)m = 2015.8714 (64)

12Total per year (kWh/year) 2016 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.6307	50.7108	53.2800	45.4859	43.1568	37.8750	36.6686	38.7081	39.7734	45.5591	49.9134	56.8279	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.7751	86.1081	77.7751	80.3676	77.7751	80.3676	77.7751	77.7751	80.3676	77.7751	80.3676	77.7751	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.9446	154.5317	150.5323	142.0180	131.2703	121.1690	114.4206	112.8335	116.8330	125.3472	136.0949	146.1963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	(71)
Water heating gains (Table 5)	77.4606	75.4625	71.6129	63.1748	58.0065	52.6042	49.2858	52.0270	55.2409	61.2353	69.3241	76.3816	(72)
Total internal gains	357.5048	365.4268	349.2448	334.8850	316.3764	303.4653	290.8060	291.9601	301.7660	313.6822	335.1112	349.6776	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.3100	0.0000	0.7700	48.4284	(76)

Solar gains	48.4284	94.7362	156.0170	227.5416	278.8607	285.4636	271.7730	233.4490	181.4543	112.4125	60.3845	39.8252	(83)
Total gains	405.9332	460.1630	505.2618	562.4266	595.2372	588.9289	562.5790	525.4091	483.2202	426.0946	395.4957	389.5027	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.9021	82.1204	82.3399	83.4552	83.6819	84.8341	84.8341	85.0684	84.3695	83.6819	83.2298	82.7825	
alpha	6.4601	6.4747	6.4893	6.5637	6.5788	6.6556	6.6556	6.6712	6.6246	6.5788	6.5487	6.5188	
util living area	0.9929	0.9833	0.9565	0.8621	0.6907	0.4884	0.3528	0.3937	0.6348	0.9109	0.9832	0.9944	(86)
MIT	20.2228	20.3861	20.6065	20.8548	20.9701	20.9973	20.9997	20.9995	20.9866	20.8187	20.4829	20.1967	(87)
Th 2	20.1711	20.1731	20.1752	20.1853	20.1874	20.1975	20.1975	20.1996	20.1935	20.1874	20.1833	20.1792	(88)
util rest of house	0.9907	0.9783	0.9438	0.8294	0.6383	0.4282	0.2886	0.3254	0.5662	0.8804	0.9771	0.9927	(89)
MIT 2	19.2738	19.4810	19.7547	20.0492	20.1649	20.1962	20.1975	20.1994	20.1856	20.0188	19.6129	19.2470	(90)
Living area fraction										fLA = Living area / (4) =		0.4510	(91)
MIT	19.7018	19.8892	20.1388	20.4125	20.5280	20.5575	20.5592	20.5602	20.5468	20.3796	20.0052	19.6753	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7018	19.8892	20.1388	20.4125	20.5280	20.5575	20.5592	20.5602	20.5468	20.3796	20.0052	19.6753	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9891	0.9761	0.9432	0.8391	0.6607	0.4553	0.3176	0.3562	0.5968	0.8884	0.9755	0.9913	(94)
Useful gains	401.5080	449.1866	476.5469	471.9362	393.2958	268.1378	178.6700	187.1596	288.3717	378.5320	385.8195	386.1088	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	720.1598	699.0031	634.3366	528.2878	404.0029	268.9323	178.7291	187.2833	292.6258	447.5490	593.7987	715.9002	(97)
Space heating kWh	237.0769	167.8767	117.3956	40.5731	7.9661	0.0000	0.0000	0.0000	0.0000	51.3487	149.7450	245.3648	(98a)
Space heating requirement - total per year (kWh/year)												1017.3469	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	237.0769	167.8767	117.3956	40.5731	7.9661	0.0000	0.0000	0.0000	0.0000	51.3487	149.7450	245.3648	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1017.3469	
Space heating per m2											(98c) / (4) =	19.4894	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	237.0769	167.8767	117.3956	40.5731	7.9661	0.0000	0.0000	0.0000	0.0000	51.3487	149.7450	245.3648	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	237.0769	167.8767	117.3956	40.5731	7.9661	0.0000	0.0000	0.0000	0.0000	51.3487	149.7450	245.3648	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	56.0243	49.4860	52.4064	45.6637	43.9882	39.3347	38.5928	40.2887	40.9134	45.9859	49.3455	55.3568	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.6264	6.8883	7.6264	7.3804	7.6264	7.3804	7.6264	7.6264	7.3804	7.6264	7.3804	7.6264	(231)
Lighting	15.8298	12.6993	11.4343	8.3772	6.4708	5.2867	5.9029	7.6728	9.9662	13.0762	14.7696	16.2698	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1017.3469	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	557.3864	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	89.7944	(230a)
Total electricity for the above, kWh/year	89.7944	(231)
Electricity for lighting (calculated in Appendix L)	127.7557	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1792.2834	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1017.3469	0.1572	159.9082	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	557.3864	0.1411	78.6404	(264)
Space and water heating			238.5486	(265)
Pumps, fans and electric keep-hot	89.7944	0.1387	12.4556	(267)
Energy for lighting	127.7557	0.1443	18.4391	(268)
Total CO2, kg/year			269.4433	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1017.3469	1.5819	1609.3198	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	557.3864	1.5217	848.1752	(278)
Space and water heating			2457.4950	(279)
Pumps, fans and electric keep-hot	89.7944	1.5128	135.8410	(281)
Energy for lighting	127.7557	1.5338	195.9559	(282)
Total Primary energy kWh/year			2789.2920	(286)
Dwelling Primary energy Rate (DPER)			53.4300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.2000	(1b)	x 2.4000	(2b) =	125.2800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	125.2800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1596	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4096	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3482	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4439	0.4352	0.4265	0.3830	0.3743	0.3308	0.3308	0.3221	0.3482	0.3743	0.3917	0.4091	(22b)
Effective ac	0.5985	0.5947	0.5910	0.5734	0.5701	0.5547	0.5547	0.5519	0.5606	0.5701	0.5767	0.5837	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.3300	1.1450	11.8282			(27)
Exposed Floor			5.8000	0.1300	0.7540			(28b)
Brickwork	25.5000	10.3300	15.1700	0.1800	2.7306			(29a)
Communal Wall	20.9900	2.0600	18.9300	0.1800	3.4074			(29a)
Cold Roof	52.2000		52.2000	0.1100	5.7420			(30)
Total net area of external elements Aum(A, m2)			104.4900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.5222			(33)
Main dwelling								
Party Wall 1			37.7200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 264.1102 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	12.8700	0.0700	0.9009	
E16 Corner (normal)	2.7500	0.0900	0.2475	
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0900	-0.2475	
E18 Party wall between dwellings	5.5000	0.0600	0.3300	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6700	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655	
E4 Jamb	18.4900	0.0500	0.9245	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.0200	0.0800	
P4 Party wall - Roof (insulation at ceiling level)	13.6700	0.1200	1.6404	
E25 Staggered party wall between dwellings	5.5000	0.0600	0.3300	
E5 Ground floor (normal)	24.5000	0.1600	3.9200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3913 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.9135 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.7453	24.5871	24.4320	23.7037	23.5674	22.9330	22.9330	22.8156	23.1774	23.5674	23.8431	24.1313	(38)
Heat transfer coeff	59.6589	59.5007	59.3456	58.6172	58.4810	57.8466	57.8466	57.7291	58.0909	58.4810	58.7566	59.0448	(39)

Average = Sum(39)m / 12 = 58.6166

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1429	1.1399	1.1369	1.1229	1.1203	1.1082	1.1082	1.1059	1.1129	1.1203	1.1256	1.1311	(40)
HLP (average)												1.1229	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7550 (42)

Hot water usage for mixer showers

53.6446	52.8384	51.6637	49.4160	47.7573	45.9075	44.8560	46.0219	47.2999	49.2860	51.5820	53.4391	(42a)

Hot water usage for baths

23.1922	22.8477	22.3627	21.4684	20.7987	20.0562	19.6551	20.1367	20.6611	21.4557	22.3684	23.1138	(42b)

Hot water usage for other uses

32.6027	31.4171	30.2316	29.0460	27.8605	26.6749	26.6749	27.8605	29.0460	30.2316	31.4171	32.6027	(42c)

Average daily hot water use (litres/day) 100.6001 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.4394	107.1033	104.2579	99.9304	96.4164	92.6385	91.1860	94.0191	97.0070	100.9733	105.3675	109.1555	(44)
Energy conte	173.3253	152.5136	160.2405	136.7997	129.7950	113.9099	110.2816	116.4152	119.6194	137.0198	150.1154	170.9111	(45)
Energy content (annual)										Total = Sum(45)m =		1670.9464	
Distribution loss (46)m = 0.15 x (45)m	25.9988	22.8770	24.0361	20.5200	19.4693	17.0865	16.5422	17.4623	17.9429	20.5530	22.5173	25.6367	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

219.9202	194.5993	206.8354	181.8915	176.3899	159.0017	156.8765	163.0101	164.7112	183.6147	195.2072	217.5060	(62)
WWHRS -24.5241	-21.6893	-22.7118	-18.8062	-17.5267	-14.9978	-14.0580	-14.9493	-15.5173	-18.2931	-20.7239	-24.0699	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

195.3961	172.9100	184.1237	163.0853	158.8632	144.0040	142.8185	148.0609	149.1940	165.3215	174.4833	193.4361	(64)
								Total per year (kWh/year) = Sum(64)m =			1991.6964	(64)

12Total per year (kWh/year) 1992 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

94.9066	84.3794	90.5559	81.5594	80.4328	73.9485	73.9445	75.9840	75.8469	82.8350	85.9868	94.1039	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	87.7486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.7751	86.1081	77.7751	80.3676	77.7751	80.3676	77.7751	77.7751	80.3676	77.7751	80.3676	77.7751	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.9446	154.5317	150.5323	142.0180	131.2703	121.1690	114.4206	112.8335	116.8330	125.3472	136.0949	146.1963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	31.7749	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	(71)
Water heating gains (Table 5)													
	127.5626	125.5645	121.7149	113.2769	108.1086	102.7063	99.3878	102.1290	105.3429	111.3374	119.4261	126.4837	(72)
Total internal gains													
	410.6068	418.5289	402.3468	387.9870	369.4785	353.5673	340.9081	342.0622	351.8680	366.7842	388.2132	402.7796	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.6300	0.7000	0.7700	62.0040	(76)

Solar gains	62.0040	121.2929	199.7521	291.3266	357.0317	365.4855	347.9571	298.8900	232.3200	143.9243	77.3117	50.9890	(83)
Total gains	472.6108	539.8218	602.0990	679.3136	726.5102	719.0528	688.8651	640.9521	584.1880	510.7085	465.5249	453.7686	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.1916	64.3623	64.5304	65.3323	65.4845	66.2027	66.2027	66.3374	65.9242	65.4845	65.1773	64.8591	
alpha	5.2794	5.2908	5.3020	5.3555	5.3656	5.4135	5.4135	5.4225	5.3949	5.3656	5.3452	5.3239	
util living area													
	0.9897	0.9784	0.9495	0.8603	0.7013	0.5079	0.3684	0.4123	0.6551	0.9065	0.9781	0.9915	(86)
MIT	19.9596	20.1536	20.4309	20.7533	20.9321	20.9901	20.9985	20.9974	20.9642	20.7129	20.2865	19.9309	(87)
Th 2	19.9660	19.9684	19.9708	19.9821	19.9843	19.9942	19.9942	19.9960	19.9904	19.9843	19.9800	19.9755	(88)
util rest of house													
	0.9863	0.9717	0.9340	0.8232	0.6395	0.4313	0.2848	0.3234	0.5717	0.8716	0.9700	0.9887	(89)
MIT 2	18.7827	19.0282	19.3715	19.7531	19.9339	19.9893	19.9938	19.9952	19.9696	19.7214	19.2067	18.7536	(90)
Living area fraction										fLA = Living area / (4) =		0.4510	(91)
MIT	19.3134	19.5357	19.8492	20.2041	20.3841	20.4406	20.4469	20.4472	20.4181	20.1685	19.6936	19.2845	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3134	19.5357	19.8492	20.2041	20.3841	20.4406	20.4469	20.4472	20.4181	20.1685	19.6936	19.2845	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9835	0.9682	0.9319	0.8320	0.6647	0.4657	0.3226	0.3635	0.6082	0.8787	0.9671	0.9863	(94)
Useful gains	464.8335	522.6299	561.0993	565.1785	482.9189	334.8324	222.1965	233.0138	355.3092	448.7779	450.2155	447.5402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	895.6848	870.8350	792.2172	662.6177	507.8520	337.8577	222.5288	233.6386	367.0240	559.5766	739.9598	890.6615	(97)
Space heating kWh													
	320.5534	233.9939	171.9517	70.1563	18.5502	0.0000	0.0000	0.0000	0.0000	82.4342	208.6158	329.6822	(98a)
Space heating requirement - total per year (kWh/year)												1435.9378	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	320.5534	233.9939	171.9517	70.1563	18.5502	0.0000	0.0000	0.0000	0.0000	82.4342	208.6158	329.6822	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1435.9378	
Space heating per m2											(98c) / (4) =	27.5084	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	320.5534	233.9939	171.9517	70.1563	18.5502	0.0000	0.0000	0.0000	0.0000	82.4342	208.6158	329.6822	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	347.2951	253.5145	186.2966	76.0089	20.0978	0.0000	0.0000	0.0000	0.0000	89.3112	226.0193	357.1855	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.3961	172.9100	184.1237	163.0853	158.8632	144.0040	142.8185	148.0609	149.1940	165.3215	174.4833	193.4361	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1626	84.7388	83.9067	82.3092	80.6547	79.8000	79.8000	79.8000	79.8000	82.5849	84.4615	85.2449	(217)
Fuel for water heating, kWh/month													
	229.4390	204.0505	219.4386	198.1373	196.9670	180.4561	178.9705	185.5399	186.9599	200.1837	206.5833	226.9179	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1601	12.9642	11.6729	8.5520	6.6058	5.3970	6.0261	7.8329	10.1742	13.3491	15.0778	16.6093	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1218	-20.9963	-31.8161	-37.7886	-42.5446	-40.3929	-39.9209	-36.8015	-31.6030	-24.9016	-15.9134	-12.0871	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9860	-10.7288	-21.7723	-33.3604	-44.7514	-45.1803	-44.6286	-37.4763	-27.0774	-15.5361	-6.7200	-3.9237	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1555.7289	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2413.6437	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.4214	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-645.0290	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3540.7651	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1555.7289	0.2100	326.7031	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2413.6437	0.2100	506.8652	(264)
Space and water heating			833.5683	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.4214	0.1443	18.8238	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-348.8877	0.1335	-46.5642	
PV Unit electricity exported	-296.1412	0.1253	-37.1143	
Total			-83.6785	(269)
Total CO2, kg/year			780.6428	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1555.7289	1.1300	1757.9737	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2413.6437	1.1300	2727.4174	(278)
Space and water heating			4485.3911	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.4214	1.5338	200.0447	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-348.8877	1.4932	-520.9589	
PV Unit electricity exported	-296.1412	0.4600	-136.2273	
Total			-657.1862	(283)
Total Primary energy kWh/year			4158.3504	(286)
Target Primary Energy Rate (TPER)			79.6600	(287)

Full SAP Calculation Printout

Plot Reference	P-18	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-18
Plot Address	Flat 14, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.16	**TER**	14.95
Environmental	97 A	**% DER < TER**			65.48
CO_2 Emissions (t/year)	0.22	**DFEE**	36.25	**TFEE**	36.64
Compliance Check	See BREL	**% DFEE < TFEE**			1.06
% DPER < TPER	32.92	**DPER**	53.43	**TPER**	79.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.2000	(1b)	x 2.4000	(2b) =	125.2800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.2000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.2800	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.8300	(17)
Infiltration rate			0.1415	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1203	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1534	0.1503	0.1473	0.1323	0.1293	0.1143	0.1143	0.1113	0.1203	0.1293	0.1353	0.1413	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2894	0.2863	0.2833	0.2683	0.2653	0.2503	0.2503	0.2473	0.2563	0.2653	0.2713	0.2773	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			10.3300	1.2357	12.7652			(27)
Exposed Floor			5.8000	0.1300	0.7539	0.0000	0.0000	(28b)
Brickwork	25.5000	10.3300	15.1700	0.2100	3.1857	110.0000	1668.7000	(29a)
Communal Wall	20.9900	2.0600	18.9300	0.2200	4.1646	110.0000	2082.3000	(29a)
Cold Roof	52.2000		52.2000	0.0900	4.6980	9.0000	469.8000	(30)
Total net area of external elements Aum(A, m2)			104.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0395			(33)
Main dwelling								
Party Wall 1			37.7200	0.0000	0.0000	110.0000	4149.2001	(32)
Party Floor 1			46.4000			70.0000	3248.0000	(32d)
Party Ceiling 1			46.0500			30.0000	1381.5000	(32b)
Internal Wall 1			87.4500			9.0000	787.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13786.5501	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 264.1102 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	12.8700	0.0380	0.4891
E16	Corner (normal)	2.7500	0.0540	0.1485
E17	Corner (inverted - internal area greater than external area)	2.7500	-0.0970	-0.2667
E18	Party wall between dwellings	5.5000	0.0380	0.2090
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6700	0.0000	0.0000
E2	Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4	Jamb	18.4900	0.0160	0.2958
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
P4	Party wall - Roof (insulation at ceiling level)	13.6700	0.1010	1.3807
E25	Staggered party wall between dwellings	5.5000	0.0310	0.1705
E5	Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7563 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.7958 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.9624	11.8381	11.7138	11.0923	10.9680	10.3464	10.3464	10.2221	10.5950	10.9680	11.2166	11.4652	(38)
Heat transfer coeff	46.7582	46.6339	46.5096	45.8880	45.7637	45.1422	45.1422	45.0179	45.3908	45.7637	46.0124	46.2610	(39)

Average = Sum(39)m / 12 = 45.8570

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8958	0.8934	0.8910	0.8791	0.8767	0.8648	0.8648	0.8624	0.8696	0.8767	0.8815	0.8862	(40)
HLP (average)												0.8785	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7550 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.6446	52.8384	51.6637	49.4160	47.7573	45.9075	44.8560	46.0219	47.2999	49.2860	51.5820	53.4391	(42a)
Hot water usage for baths	23.1922	22.8477	22.3627	21.4684	20.7987	20.0562	19.6551	20.1367	20.6611	21.4557	22.3684	23.1138	(42b)
Hot water usage for other uses	32.6027	31.4171	30.2316	29.0460	27.8605	26.6749	26.6749	27.8605	29.0460	30.2316	31.4171	32.6027	(42c)

Average daily hot water use (litres/day) 100.6001 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.4394	107.1033	104.2579	99.9304	96.4164	92.6385	91.1860	94.0191	97.0070	100.9733	105.3675	109.1555	(44)
Energy conte	173.3253	152.5136	160.2405	136.7997	129.7950	113.9099	110.2816	116.4152	119.6194	137.0198	150.1154	170.9111	(45)

Energy content (annual) Total = Sum(45)m = 1670.9464

Distribution loss (46)m = 0.15 x (45)m	25.9988	22.8770	24.0361	20.5200	19.4693	17.0865	16.5422	17.4623	17.9429	20.5530	22.5173	25.6367	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(64)

Total per year (kWh/year) = Sum(64)m = 2015.8714 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	57.6307	50.7108	53.2800	45.4859	43.1568	37.8750	36.6686	38.7081	39.7734	45.5591	49.9134	56.8279	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0851	16.0631	13.0634	9.8898	7.3927	6.2413	6.7439	8.7660	11.7657	14.9392	17.4363	18.5878	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.2756	230.6443	224.6751	211.9672	195.9258	180.8492	170.7771	168.4083	174.3775	187.0854	203.1268	218.2034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	(71)
Water heating gains (Table 5)	77.4606	75.4625	71.6129	63.1748	58.0065	52.6042	49.2858	52.0270	55.2409	61.2353	69.3241	76.3816	(72)
Total internal gains	406.2055	404.5541	391.7355	367.4161	343.7093	322.0789	309.1910	311.5855	323.7683	345.6442	372.2714	395.5571	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.3100	0.0000	0.7700	48.4284	(76)

Solar gains	48.4284	94.7362	156.0170	227.5416	278.8607	285.4636	271.7730	233.4490	181.4543	112.4125	60.3845	39.8252	(83)
Total gains	454.6339	499.2903	547.7526	594.9576	622.5700	607.5425	580.9639	545.0344	505.2226	458.0567	432.6559	435.3822	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.9021	82.1204	82.3399	83.4552	83.6819	84.8341	84.8341	85.0684	84.3695	83.6819	83.2298	82.7825	
alpha	6.4601	6.4747	6.4893	6.5637	6.5788	6.6556	6.6556	6.6712	6.6246	6.5788	6.5487	6.5188	
util living area	0.9871	0.9749	0.9383	0.8360	0.6649	0.4738	0.3417	0.3796	0.6097	0.8841	0.9736	0.9898	(86)
MIT	20.3168	20.4566	20.6697	20.8806	20.9759	20.9978	20.9998	20.9996	20.9894	20.8535	20.5497	20.2865	(87)
Th 2	20.1711	20.1731	20.1752	20.1853	20.1874	20.1975	20.1975	20.1996	20.1935	20.1874	20.1833	20.1792	(88)
util rest of house	0.9832	0.9678	0.9218	0.8006	0.6131	0.4152	0.2795	0.3137	0.5428	0.8486	0.9647	0.9867	(89)
MIT 2	19.3922	19.5683	19.8289	20.0754	20.1695	20.1964	20.1975	20.1994	20.1873	20.0548	19.6948	19.3605	(90)
Living area fraction										fLA = Living area / (4) =		0.4510	(91)
MIT	19.8092	19.9689	20.2080	20.4385	20.5331	20.5578	20.5593	20.5603	20.5490	20.4150	20.0803	19.7781	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8092	19.9689	20.2080	20.4385	20.5331	20.5578	20.5593	20.5603	20.5490	20.4150	20.0803	19.7781	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9811	0.9657	0.9226	0.8122	0.6355	0.4416	0.3076	0.3434	0.5727	0.8594	0.9634	0.9848	(94)
Useful gains	446.0638	482.1473	505.3415	483.2204	395.6377	268.2845	178.6820	187.1875	289.3593	393.6525	416.8304	428.7808	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	725.1809	702.7212	637.5555	529.4793	404.2373	268.9469	178.7304	187.2863	292.7241	449.1703	597.2543	720.6590	(97)
Space heating kWh	207.6631	148.2256	98.3672	33.3064	6.3981	0.0000	0.0000	0.0000	0.0000	41.3052	129.9052	217.1574	(98a)
Space heating requirement - total per year (kWh/year)												882.3284	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	207.6631	148.2256	98.3672	33.3064	6.3981	0.0000	0.0000	0.0000	0.0000	41.3052	129.9052	217.1574	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												882.3284	
Space heating per m2											(98c) / (4) =	16.9028	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	207.6631	148.2256	98.3672	33.3064	6.3981	0.0000	0.0000	0.0000	0.0000	41.3052	129.9052	217.1574	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	207.6631	148.2256	98.3672	33.3064	6.3981	0.0000	0.0000	0.0000	0.0000	41.3052	129.9052	217.1574	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	56.0243	49.4860	52.4064	45.6637	43.9882	39.3347	38.5928	40.2887	40.9134	45.9859	49.3455	55.3568	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.6264	6.8883	7.6264	7.3804	7.6264	7.3804	7.6264	7.6264	7.3804	7.6264	7.3804	7.6264	(231)
Lighting	15.8298	12.6993	11.4343	8.3772	6.4708	5.2867	5.9029	7.6728	9.9662	13.0762	14.7696	16.2698	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												882.3284	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												557.3864	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	89.7944	(230a)
Total electricity for the above, kWh/year	89.7944	(231)
Electricity for lighting (calculated in Appendix L)	127.7557	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1657.2649	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	882.3284	16.4900	145.4959	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	557.3864	16.4900	91.9130	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	89.7944	16.4900	14.8071	(249)
Energy for lighting	127.7557	16.4900	21.0669	(250)
Additional standing charges			0.0000	(251)
Total energy cost			273.2830	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0122	(257)
SAP value		83.5929	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	882.3284	0.1574	138.8526	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	557.3864	0.1411	78.6404	(264)
Space and water heating			217.4930	(265)
Pumps, fans and electric keep-hot	89.7944	0.1387	12.4556	(267)
Energy for lighting	127.7557	0.1443	18.4391	(268)
Total CO2, kg/year			248.3877	(272)
CO2 emissions per m2			4.7600	(273)
EI value			96.5757	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.2000	(1b)	x 2.4000	(2b) =	125.2800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 52.2000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		125.2800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	2.8300	(17)
Infiltration rate	0.1415	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1203	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1293	0.1233	0.1233	0.1143	0.1173	0.1022	0.1022	0.0992	0.1022	0.1143	0.1113	0.1203	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2653	0.2593	0.2593	0.2503	0.2533	0.2382	0.2382	0.2352	0.2382	0.2503	0.2473	0.2563	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			10.3300	1.2357	12.7652			(27)
Exposed Floor			5.8000	0.1300	0.7539	0.0000	0.0000	(28b)
Brickwork	25.5000	10.3300	15.1700	0.2100	3.1857	110.0000	1668.7000	(29a)
Communal Wall	20.9900	2.0600	18.9300	0.2200	4.1646	110.0000	2082.3000	(29a)
Cold Roof	52.2000		52.2000	0.0900	4.6980	9.0000	469.8000	(30)
Total net area of external elements Aum(A, m2)			104.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0395			(33)
Main dwelling								
Party Wall 1			37.7200	0.0000	0.0000	110.0000	4149.2001	(32)
Party Floor 1			46.4000			70.0000	3248.0000	(32d)
Party Ceiling 1			46.0500			30.0000	1381.5000	(32b)
Internal Wall 1			87.4500			9.0000	787.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	13786.5501	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	264.1102	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.8700	0.0380	0.4891
E16 Corner (normal)	2.7500	0.0540	0.1485
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0970	-0.2667
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6700	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
P4 Party wall - Roof (insulation at ceiling level)	13.6700	0.1010	1.3807
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.7563	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	34.7958	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.9680	10.7193	10.7193	10.3464	10.4707	9.8492	9.8492	9.7248	9.8492	10.3464	10.2221	10.5950	(38)
Heat transfer coeff	45.7637	45.5151	45.5151	45.1422	45.2665	44.6449	44.6449	44.5206	44.6449	45.1422	45.0179	45.3908	(39)
Average = Sum(39)m / 12 =												45.1007	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8767	0.8719	0.8719	0.8648	0.8672	0.8553	0.8553	0.8529	0.8553	0.8648	0.8624	0.8696	(40)
HLP (average)												0.8640	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7550	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.6446	52.8384	51.6637	49.4160	47.7573	45.9075	44.8560	46.0219	47.2999	49.2860	51.5820	53.4391	(42a)
Hot water usage for baths	23.1922	22.8477	22.3627	21.4684	20.7987	20.0562	19.6551	20.1367	20.6611	21.4557	22.3684	23.1138	(42b)
Hot water usage for other uses	32.6027	31.4171	30.2316	29.0460	27.8605	26.6749	26.6749	27.8605	29.0460	30.2316	31.4171	32.6027	(42c)
Average daily hot water use (litres/day)												100.6001	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.4394	107.1033	104.2579	99.9304	96.4164	92.6385	91.1860	94.0191	97.0070	100.9733	105.3675	109.1555	(44)
Energy conte	173.3253	152.5136	160.2405	136.7997	129.7950	113.9099	110.2816	116.4152	119.6194	137.0198	150.1154	170.9111	(45)
Energy content (annual)										Total = Sum(45)m =		1670.9464	
Distribution loss (46)m = 0.15 x (45)m	25.9988	22.8770	24.0361	20.5200	19.4693	17.0865	16.5422	17.4623	17.9429	20.5530	22.5173	25.6367	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061 (64)
Total per year (kWh/year) = Sum(64)m =												2015.8714 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	57.6307	50.7108	53.2800	45.4859	43.1568	37.8750	36.6686	38.7081	39.7734	45.5591	49.9134	56.8279 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.0851	16.0631	13.0634	9.8898	7.3927	6.2413	6.7439	8.7660	11.7657	14.9392	17.4363	18.5878	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	228.2756	230.6443	224.6751	211.9672	195.9258	180.8492	170.7771	168.4083	174.3775	187.0854	203.1268	218.2034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	(71)
Water heating gains (Table 5)													
	77.4606	75.4625	71.6129	63.1748	58.0065	52.6042	49.2858	52.0270	55.2409	61.2353	69.3241	76.3816	(72)
Total internal gains													
	406.2055	404.5541	391.7355	367.4161	343.7093	322.0789	309.1910	311.5855	323.7683	345.6442	372.2714	395.5571	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	23.8018	0.3100	0.0000	0.7700	58.6897	(76)

Solar gains	58.6897	100.2809	163.6554	241.6869	288.0562	311.7136	293.9162	259.2064	202.6914	127.6460	72.0863	48.5416	(83)
Total gains	464.8952	504.8350	555.3909	609.1030	631.7655	633.7925	603.1072	570.7919	526.4598	473.2902	444.3577	444.0986	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.6819	84.1390	84.1390	84.8341	84.6012	85.7790	85.7790	86.0185	85.7790	84.8341	85.0684	84.3695	
alpha	6.5788	6.6093	6.6093	6.6556	6.6401	6.7186	6.7186	6.7346	6.7186	6.6556	6.6712	6.6246	
util living area													
	0.9804	0.9641	0.9107	0.7714	0.5737	0.3660	0.2443	0.2652	0.5061	0.8228	0.9564	0.9842	(86)
MIT	20.4388	20.5668	20.7661	20.9354	20.9913	20.9996	21.0000	21.0000	20.9971	20.9184	20.6683	20.4117	(87)
Th 2	20.1874	20.1914	20.1914	20.1975	20.1955	20.2057	20.2057	20.2077	20.2057	20.1975	20.1996	20.1935	(88)
util rest of house													
	0.9745	0.9539	0.8881	0.7289	0.5193	0.3103	0.1855	0.2034	0.4404	0.7760	0.9421	0.9793	(89)
MIT 2	19.5585	19.7195	19.9556	20.1422	20.1898	20.2056	20.2057	20.2077	20.2043	20.1302	19.8529	19.5299	(90)
Living area fraction									fLA = Living area / (4) =			0.4510	(91)
MIT	19.9555	20.1016	20.3211	20.4999	20.5512	20.5637	20.5639	20.5650	20.5618	20.4857	20.2206	19.9275	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9555	20.1016	20.3211	20.4999	20.5512	20.5637	20.5639	20.5650	20.5618	20.4857	20.2206	19.9275	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9725	0.9526	0.8921	0.7455	0.5436	0.3354	0.2120	0.2313	0.4700	0.7937	0.9426	0.9774	(94)
Useful gains	452.1158	480.9019	495.4467	454.0624	343.4243	212.5809	127.8548	131.9981	247.4616	375.6625	418.8419	434.0602	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	679.8426	655.4893	588.1053	478.5011	346.3450	212.6729	127.8578	132.0034	248.3057	405.6327	550.1456	673.0342	(97)
Space heating kWh													
	169.4287	117.3227	68.9380	17.5959	2.1730	0.0000	0.0000	0.0000	0.0000	22.2978	94.5387	177.7966	(98a)
Space heating requirement - total per year (kWh/year)												670.0914	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	169.4287	117.3227	68.9380	17.5959	2.1730	0.0000	0.0000	0.0000	0.0000	22.2978	94.5387	177.7966	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												670.0914	
Space heating per m2											(98c) / (4) =	12.8370	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	169.4287	117.3227	68.9380	17.5959	2.1730	0.0000	0.0000	0.0000	0.0000	22.2978	94.5387	177.7966	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)
169.4287 117.3227 68.9380 17.5959 2.1730 0.0000 0.0000 0.0000 0.0000 22.2978 94.5387 177.7966 (211)
Space heating efficiency (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (212)
Space heating fuel (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (213)
Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
202.6203 178.9736 189.5355 165.1497 159.0900 142.2599 139.5766 145.7102 147.9694 166.3148 178.4654 200.2061 (64)
Efficiency of water heater 361.6650 (216)
(217)m 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 361.6650 (217)
Fuel for water heating, kWh/month
56.0243 49.4860 52.4064 45.6637 43.9882 39.3347 38.5928 40.2887 40.9134 45.9859 49.3455 55.3568 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 7.6264 6.8883 7.6264 7.3804 7.6264 7.3804 7.6264 7.6264 7.3804 7.6264 7.3804 7.6264 (231)
Lighting 15.8298 12.6993 11.4343 8.3772 6.4708 5.2867 5.9029 7.6728 9.9662 13.0762 14.7696 16.2698 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 670.0914 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 557.3864 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 89.7944 (230a)
Total electricity for the above, kWh/year 89.7944 (231)
Electricity for lighting (calculated in Appendix L) 127.7557 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1445.0279 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	670.0914	27.6700	185.4143	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	557.3864	27.6700	154.2288	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	89.7944	27.6700	24.8461	(249)
Energy for lighting	127.7557	27.6700	35.3500	(250)
Additional standing charges			0.0000	(251)
Total energy cost			399.8392	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	670.0914	0.1582	106.0278	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	557.3864	0.1411	78.6404	(264)
Space and water heating			184.6682	(265)
Pumps, fans and electric keep-hot	89.7944	0.1387	12.4556	(267)
Energy for lighting	127.7557	0.1443	18.4391	(268)
Total CO2, kg/year			215.5628	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	670.0914	1.5857	1062.5805	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	557.3864	1.5217	848.1752	(278)
Space and water heating			1910.7558	(279)
Pumps, fans and electric keep-hot	89.7944	1.5128	135.8410	(281)
Energy for lighting	127.7557	1.5338	195.9559	(282)
Total Primary energy kWh/year			2242.5527	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 84
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£400	£400	£0
Space heating	£210	£210	£0
Water heating	£154	£154	£0
Lighting	£35	£35	£0
Total cost of fuels	£400	£400	£0
Total cost of uses	£399	£399	£0
Delivered energy	28 kWh/m²	28 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	43 kWh/m²	43 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.2000 (1b)	x	2.4000 (2b)	=	125.2800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	125.2800	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8300	(17)
Infiltration rate		0.1415	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1203	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1534	0.1503	0.1473	0.1323	0.1293	0.1143	0.1143	0.1113	0.1203	0.1293	0.1353	0.1413	(22b)

Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

Effective ac	0.2894	0.2863	0.2833	0.2683	0.2653	0.2503	0.2503	0.2473	0.2563	0.2653	0.2713	0.2773 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			10.3300	1.2357	12.7652			(27)
Exposed Floor			5.8000	0.1300	0.7539	0.0000	0.0000	(28b)
Brickwork	25.5000	10.3300	15.1700	0.2100	3.1857	110.0000	1668.7000	(29a)
Communal Wall	20.9900	2.0600	18.9300	0.2200	4.1646	110.0000	2082.3000	(29a)
Cold Roof	52.2000		52.2000	0.0900	4.6980	9.0000	469.8000	(30)
Total net area of external elements Aum(A, m2)			104.4900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.0395			(33)
Main dwelling								
Party Wall 1			37.7200	0.0000	0.0000	110.0000	4149.2001	(32)
Party Floor 1			46.4000			70.0000	3248.0000	(32d)
Party Ceiling 1			46.0500			30.0000	1381.5000	(32b)
Internal Wall 1			87.4500			9.0000	787.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13786.5501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		264.1102 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.8700	0.0380	0.4891
E16 Corner (normal)	2.7500	0.0540	0.1485
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0970	-0.2667
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6700	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
P4 Party wall - Roof (insulation at ceiling level)	13.6700	0.1010	1.3807
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.7563 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	34.7958 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.9624	11.8381	11.7138	11.0923	10.9680	10.3464	10.3464	10.2221	10.5950	10.9680	11.2166	11.4652	(38)
Heat transfer coeff	46.7582	46.6339	46.5096	45.8880	45.7637	45.1422	45.1422	45.0179	45.3908	45.7637	46.0124	46.2610	(39)
Average = Sum(39)m / 12 =												45.8570	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8958	0.8934	0.8910	0.8791	0.8767	0.8648	0.8648	0.8624	0.8696	0.8767	0.8815	0.8862	(40)
HLP (average)												0.8785	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7550 (42)
Hot water usage for mixer showers	53.6446	52.8384	51.6637	49.4160	47.7573	45.9075	44.8560	46.0219	47.2999	49.2860	51.5820	53.4391 (42a)
Hot water usage for baths	23.1922	22.8477	22.3627	21.4684	20.7987	20.0562	19.6551	20.1367	20.6611	21.4557	22.3684	23.1138 (42b)
Hot water usage for other uses	32.6027	31.4171	30.2316	29.0460	27.8605	26.6749	26.6749	27.8605	29.0460	30.2316	31.4171	32.6027 (42c)
Average daily hot water use (litres/day)												100.6001 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.4394	107.1033	104.2579	99.9304	96.4164	92.6385	91.1860	94.0191	97.0070	100.9733	105.3675	109.1555	(44)
Energy conte	173.3253	152.5136	160.2405	136.7997	129.7950	113.9099	110.2816	116.4152	119.6194	137.0198	150.1154	170.9111	(45)
Energy content (annual)										Total = Sum(45)m =		1670.9464	
Distribution loss (46)m = 0.15 x (45)m	25.9988	22.8770	24.0361	20.5200	19.4693	17.0865	16.5422	17.4623	17.9429	20.5530	22.5173	25.6367	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(64)
										Total per year (kWh/year) = Sum(64)m =		2015.8714	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	57.6307	50.7108	53.2800	45.4859	43.1568	37.8750	36.6686	38.7081	39.7734	45.5591	49.9134	56.8279	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.0851	16.0631	13.0634	9.8898	7.3927	6.2413	6.7439	8.7660	11.7657	14.9392	17.4363	18.5878	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	228.2756	230.6443	224.6751	211.9672	195.9258	180.8492	170.7771	168.4083	174.3775	187.0854	203.1268	218.2034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	(71)
Water heating gains (Table 5)													
	77.4606	75.4625	71.6129	63.1748	58.0065	52.6042	49.2858	52.0270	55.2409	61.2353	69.3241	76.3816	(72)
Total internal gains													
	406.2055	404.5541	391.7355	367.4161	343.7093	322.0789	309.1910	311.5855	323.7683	345.6442	372.2714	395.5571	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.3100	0.0000	0.7700	48.4284	(76)

Solar gains	48.4284	94.7362	156.0170	227.5416	278.8607	285.4636	271.7730	233.4490	181.4543	112.4125	60.3845	39.8252	(83)
Total gains	454.6339	499.2903	547.7526	594.9576	622.5700	607.5425	580.9639	545.0344	505.2226	458.0567	432.6559	435.3822	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.9021	82.1204	82.3399	83.4552	83.6819	84.8341	84.8341	85.0684	84.3695	83.6819	83.2298	82.7825	
alpha	6.4601	6.4747	6.4893	6.5637	6.5788	6.6556	6.6556	6.6712	6.6246	6.5788	6.5487	6.5188	
util living area													
	0.9871	0.9749	0.9383	0.8360	0.6649	0.4738	0.3417	0.3796	0.6097	0.8841	0.9736	0.9898	(86)
MIT	20.3168	20.4566	20.6697	20.8806	20.9759	20.9978	20.9998	20.9996	20.9894	20.8535	20.5497	20.2865	(87)
Th 2	20.1711	20.1731	20.1752	20.1853	20.1874	20.1975	20.1975	20.1996	20.1935	20.1874	20.1833	20.1792	(88)
util rest of house													
	0.9832	0.9678	0.9218	0.8006	0.6131	0.4152	0.2795	0.3137	0.5428	0.8486	0.9647	0.9867	(89)
MIT 2	19.3922	19.5683	19.8289	20.0754	20.1695	20.1964	20.1975	20.1994	20.1873	20.0548	19.6948	19.3605	(90)
Living area fraction										fLA = Living area / (4) =		0.4510	(91)
MIT	19.8092	19.9689	20.2080	20.4385	20.5331	20.5578	20.5593	20.5603	20.5490	20.4150	20.0803	19.7781	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8092	19.9689	20.2080	20.4385	20.5331	20.5578	20.5593	20.5603	20.5490	20.4150	20.0803	19.7781	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9811	0.9657	0.9226	0.8122	0.6355	0.4416	0.3076	0.3434	0.5727	0.8594	0.9634	0.9848	(94)
Useful gains	446.0638	482.1473	505.3415	483.2204	395.6377	268.2845	178.6820	187.1875	289.3593	393.6525	416.8304	428.7808	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	725.1809	702.7212	637.5555	529.4793	404.2373	268.9469	178.7304	187.2863	292.7241	449.1703	597.2543	720.6590	(97)
Space heating kWh													
	207.6631	148.2256	98.3672	33.3064	6.3981	0.0000	0.0000	0.0000	0.0000	41.3052	129.9052	217.1574	(98a)
Space heating requirement - total per year (kWh/year)												882.3284	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	207.6631	148.2256	98.3672	33.3064	6.3981	0.0000	0.0000	0.0000	0.0000	41.3052	129.9052	217.1574	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												882.3284	
Space heating per m2											(98c) / (4) =	16.9028	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	207.6631	148.2256	98.3672	33.3064	6.3981	0.0000	0.0000	0.0000	0.0000	41.3052	129.9052	217.1574	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	207.6631	148.2256	98.3672	33.3064	6.3981	0.0000	0.0000	0.0000	0.0000	41.3052	129.9052	217.1574	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	56.0243	49.4860	52.4064	45.6637	43.9882	39.3347	38.5928	40.2887	40.9134	45.9859	49.3455	55.3568	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.6264	6.8883	7.6264	7.3804	7.6264	7.3804	7.6264	7.6264	7.3804	7.6264	7.3804	7.6264	(231)
Lighting	15.8298	12.6993	11.4343	8.3772	6.4708	5.2867	5.9029	7.6728	9.9662	13.0762	14.7696	16.2698	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	882.3284	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	557.3864	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	89.7944	(230a)
Total electricity for the above, kWh/year	89.7944	(231)
Electricity for lighting (calculated in Appendix L)	127.7557	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1657.2649	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	882.3284	16.4900	145.4959	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	557.3864	16.4900	91.9130	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	89.7944	16.4900	14.8071	(249)
Energy for lighting	127.7557	16.4900	21.0669	(250)
Additional standing charges			0.0000	(251)
Total energy cost			273.2830	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0122	(257)
SAP value		83.5929	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	882.3284	0.1574	138.8526	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	557.3864	0.1411	78.6404	(264)
Space and water heating			217.4930	(265)
Pumps, fans and electric keep-hot	89.7944	0.1387	12.4556	(267)
Energy for lighting	127.7557	0.1443	18.4391	(268)
Total CO2, kg/year			248.3877	(272)
CO2 emissions per m2			4.7600	(273)
EI value			96.5757	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.2000	(1b) x	2.4000	(2b) =	125.2800	(1b) - (3b)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 52.2000 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 125.2800 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8300	(17)
Infiltration rate		0.1415	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1203	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1293	0.1233	0.1233	0.1143	0.1173	0.1022	0.1022	0.0992	0.1022	0.1143	0.1113	0.1203	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2653	0.2593	0.2593	0.2503	0.2533	0.2382	0.2382	0.2352	0.2382	0.2503	0.2473	0.2563	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-RED			10.3300	1.2357	12.7652			(27)
Exposed Floor			5.8000	0.1300	0.7539	0.0000	0.0000	(28b)
Brickwork	25.5000	10.3300	15.1700	0.2100	3.1857	110.0000	1668.7000	(29a)
Communal Wall	20.9900	2.0600	18.9300	0.2200	4.1646	110.0000	2082.3000	(29a)
Cold Roof	52.2000		52.2000	0.0900	4.6980	9.0000	469.8000	(30)
Total net area of external elements Aum(A, m2)			104.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0395			(33)
Main dwelling								
Party Wall 1			37.7200	0.0000	0.0000	110.0000	4149.2001	(32)
Party Floor 1			46.4000			70.0000	3248.0000	(32d)
Party Ceiling 1			46.0500			30.0000	1381.5000	(32b)
Internal Wall 1			87.4500			9.0000	787.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 13786.5501	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	264.1102	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.8700	0.0380	0.4891
E16 Corner (normal)	2.7500	0.0540	0.1485
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0970	-0.2667
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6700	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
P4 Party wall - Roof (insulation at ceiling level)	13.6700	0.1010	1.3807
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.7563	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	34.7958	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.9680	10.7193	10.7193	10.3464	10.4707	9.8492	9.8492	9.7248	9.8492	10.3464	10.2221	10.5950	(38)
Heat transfer coeff	45.7637	45.5151	45.5151	45.1422	45.2665	44.6449	44.6449	44.5206	44.6449	45.1422	45.0179	45.3908	(39)
Average = Sum(39)m / 12 =												45.1007	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8767	0.8719	0.8719	0.8648	0.8672	0.8553	0.8553	0.8529	0.8553	0.8648	0.8624	0.8696	(40)
HLP (average)												0.8640	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7550	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.6446	52.8384	51.6637	49.4160	47.7573	45.9075	44.8560	46.0219	47.2999	49.2860	51.5820	53.4391	(42a)

Hot water usage for baths

23.1922	22.8477	22.3627	21.4684	20.7987	20.0562	19.6551	20.1367	20.6611	21.4557	22.3684	23.1138	(42b)

Hot water usage for other uses

32.6027	31.4171	30.2316	29.0460	27.8605	26.6749	26.6749	27.8605	29.0460	30.2316	31.4171	32.6027	(42c)

Average daily hot water use (litres/day)	100.6001	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.4394	107.1033	104.2579	99.9304	96.4164	92.6385	91.1860	94.0191	97.0070	100.9733	105.3675	109.1555	(44)
Energy conte	173.3253	152.5136	160.2405	136.7997	129.7950	113.9099	110.2816	116.4152	119.6194	137.0198	150.1154	170.9111	(45)
Energy content (annual)										Total = Sum(45)m =		1670.9464	
Distribution loss (46)m = 0.15 x (45)m	25.9988	22.8770	24.0361	20.5200	19.4693	17.0865	16.5422	17.4623	17.9429	20.5530	22.5173	25.6367	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(64)
										Total per year (kWh/year) = Sum(64)m =		2015.8714	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	57.6307	50.7108	53.2800	45.4859	43.1568	37.8750	36.6686	38.7081	39.7734	45.5591	49.9134	56.8279	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	105.2983	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0851	16.0631	13.0634	9.8898	7.3927	6.2413	6.7439	8.7660	11.7657	14.9392	17.4363	18.5878	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.2756	230.6443	224.6751	211.9672	195.9258	180.8492	170.7771	168.4083	174.3775	187.0854	203.1268	218.2034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	47.2848	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	-70.1988	(71)
Water heating gains (Table 5)	77.4606	75.4625	71.6129	63.1748	58.0065	52.6042	49.2858	52.0270	55.2409	61.2353	69.3241	76.3816	(72)
Total internal gains	406.2055	404.5541	391.7355	367.4161	343.7093	322.0789	309.1910	311.5855	323.7683	345.6442	372.2714	395.5571	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	23.8018	0.3100	0.0000	0.7700	58.6897	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	58.6897	100.2809	163.6554	241.6869	288.0562	311.7136	293.9162	259.2064	202.6914	127.6460	72.0863	48.5416	(83)
Total gains	464.8952	504.8350	555.3909	609.1030	631.7655	633.7925	603.1072	570.7919	526.4598	473.2902	444.3577	444.0986	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.6819	84.1390	84.1390	84.8341	84.6012	85.7790	85.7790	86.0185	85.7790	84.8341	85.0684	84.3695	
alpha	6.5788	6.6093	6.6093	6.6556	6.6401	6.7186	6.7186	6.7346	6.7186	6.6556	6.6712	6.6246	
util living area	0.9804	0.9641	0.9107	0.7714	0.5737	0.3660	0.2443	0.2652	0.5061	0.8228	0.9564	0.9842	(86)
MIT	20.4388	20.5668	20.7661	20.9354	20.9913	20.9996	21.0000	21.0000	20.9971	20.9184	20.6683	20.4117	(87)
Th 2	20.1874	20.1914	20.1914	20.1975	20.1955	20.2057	20.2057	20.2077	20.2057	20.1975	20.1996	20.1935	(88)
util rest of house	0.9745	0.9539	0.8881	0.7289	0.5193	0.3103	0.1855	0.2034	0.4404	0.7760	0.9421	0.9793	(89)
MIT 2	19.5585	19.7195	19.9556	20.1422	20.1898	20.2056	20.2057	20.2077	20.2043	20.1302	19.8529	19.5299	(90)
Living area fraction									fLA = Living area / (4) =			0.4510	(91)
MIT	19.9555	20.1016	20.3211	20.4999	20.5512	20.5637	20.5639	20.5650	20.5618	20.4857	20.2206	19.9275	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9555	20.1016	20.3211	20.4999	20.5512	20.5637	20.5639	20.5650	20.5618	20.4857	20.2206	19.9275	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9725	0.9526	0.8921	0.7455	0.5436	0.3354	0.2120	0.2313	0.4700	0.7937	0.9426	0.9774	(94)
Useful gains	452.1158	480.9019	495.4467	454.0624	343.4243	212.5809	127.8548	131.9981	247.4616	375.6625	418.8419	434.0602	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	679.8426	655.4893	588.1053	478.5011	346.3450	212.6729	127.8578	132.0034	248.3057	405.6327	550.1456	673.0342	(97)
Space heating kWh	169.4287	117.3227	68.9380	17.5959	2.1730	0.0000	0.0000	0.0000	0.0000	22.2978	94.5387	177.7966	(98a)
Space heating requirement - total per year (kWh/year)												670.0914	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

169.4287	117.3227	68.9380	17.5959	2.1730	0.0000	0.0000	0.0000	0.0000	22.2978	94.5387	177.7966	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 670.0914

Space heating per m2 (98c) / (4) = 12.8370 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	169.4287	117.3227	68.9380	17.5959	2.1730	0.0000	0.0000	0.0000	0.0000	22.2978	94.5387	177.7966	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	169.4287	117.3227	68.9380	17.5959	2.1730	0.0000	0.0000	0.0000	0.0000	22.2978	94.5387	177.7966	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	202.6203	178.9736	189.5355	165.1497	159.0900	142.2599	139.5766	145.7102	147.9694	166.3148	178.4654	200.2061	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	56.0243	49.4860	52.4064	45.6637	43.9882	39.3347	38.5928	40.2887	40.9134	45.9859	49.3455	55.3568	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.6264	6.8883	7.6264	7.3804	7.6264	7.3804	7.6264	7.6264	7.3804	7.6264	7.3804	7.6264	(231)
Lighting	15.8298	12.6993	11.4343	8.3772	6.4708	5.2867	5.9029	7.6728	9.9662	13.0762	14.7696	16.2698	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 670.0914 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 557.3864 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 89.7944 (230a)
Total electricity for the above, kWh/year 89.7944 (231)
Electricity for lighting (calculated in Appendix L) 127.7557 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1445.0279 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	670.0914	27.6700	185.4143	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	557.3864	27.6700	154.2288	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	89.7944	27.6700	24.8461	(249)
Energy for lighting	127.7557	27.6700	35.3500	(250)
Additional standing charges			0.0000	(251)
Total energy cost			399.8392	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	670.0914	0.1582	106.0278	(261)

Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	557.3864	0.1411	78.6404	(264)
Space and water heating			184.6682	(265)
Pumps, fans and electric keep-hot	89.7944	0.1387	12.4556	(267)
Energy for lighting	127.7557	0.1443	18.4391	(268)
Total CO2, kg/year			215.5628	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	670.0914	1.5857	1062.5805	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	557.3864	1.5217	848.1752	(278)
Space and water heating			1910.7558	(279)
Pumps, fans and electric keep-hot	89.7944	1.5128	135.8410	(281)
Energy for lighting	127.7557	1.5338	195.9559	(282)
Total Primary energy kWh/year			2242.5527	(286)

Summary for Input Data

Plot Reference	P-19	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-19
Plot Address	Flat 15, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.63	**TER**	13.69
Environmental	96 A	**% DER < TER**			66.18
CO_2 Emissions (t/year)	0.26	**DFEE**	34.16	**TFEE**	37.10
Compliance Check	See BREL	**% DFEE < TFEE**			7.94
% DPER < TPER	34.07	**DPER**	47.91	**TPER**	72.67

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	20.99 m	70.23 m²	2.40 m

8.0 Living Area	25.98	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	29.74	18.87	0.00	None	10.87	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	18.73	16.67	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	9.77	9.77	0.70	Stairwell Access Corridor 3	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	36.81	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	157.90

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Terrace Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	29.16	29.16	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

Cold Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	41.07	41.07	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete planks floor, screed, carpeted	40.00	70.23

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	North	2.06	
Patio Door	Patio Door	Brickwork	West	5.42	
South	Window	Brickwork	West	5.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	17.16	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	8.25	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	13.40	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.02	0.33	0.33	Abbey Calculated	No
E15 Flat roof with parapet	Table K1 - Default	8.49	0.30	0.30		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	13.40	0.10	0.10	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	5.54	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.49	0.02	0.02	RCD	Yes
E16 Corner (normal)	Gov Approved Scheme	8.55	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.85	-0.10	-0.10	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0

Summary for Input Data

elmhurst energy

Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.52	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store

Summary for Input Data

Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None										
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-19	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-19
Plot Address	Flat 15, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.63	**TER**	13.69
Environmental	96 A	**% DER < TER**			66.18
CO_2 Emissions (t/year)	0.26	**DFEE**	34.16	**TFEE**	37.10
Compliance Check	See BREL	**% DFEE < TFEE**			7.94
% DPER < TPER	34.07	**DPER**	47.91	**TPER**	72.67

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.2300	(1b)	x 2.4000	(2b) =	168.5520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	168.5520	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5200	(17)
Infiltration rate		0.1260	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1071	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1366	0.1339	0.1312	0.1178	0.1151	0.1017	0.1017	0.0991	0.1071	0.1151	0.1205	0.1258	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2726	0.2699	0.2672	0.2538	0.2511	0.2377	0.2377	0.2351	0.2431	0.2511	0.2565	0.2618	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	29.7400	10.8700	18.8700	0.2100	3.9627	110.0000	2075.7000	(29a)
Communal Wall	18.7300	2.0600	16.6700	0.2200	3.6674	110.0000	1833.6999	(29a)
Lift Shaft Wall	9.7700		9.7700	0.2100	2.0517	110.0000	1074.7001	(29a)
Terrace Roof	29.1600		29.1600	0.1300	3.7908	9.0000	262.4400	(30)
Cold Roof	41.0700		41.0700	0.0900	3.6963	9.0000	369.6300	(30)
Total net area of external elements Aum(A, m2)			128.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0875			(33)
Main dwelling								
Party Wall 1			36.8100	0.0000	0.0000	110.0000	4049.1002	(32)
Party Floor 1			70.2300			40.0000	2809.2000	(32d)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13895.5701 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 197.8580 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	17.1600	0.0380	0.6521
E18 Party wall between dwellings	8.2500	0.0380	0.3135
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0200	0.3300	1.3266
E15 Flat roof with parapet	8.4900	0.3000	2.5470
P4 Party wall - Roof (insulation at ceiling level)	13.4000	0.1010	1.3534
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7830 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.8705 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.1600	15.0110	14.8621	14.1175	13.9685	13.2239	13.2239	13.0750	13.5217	13.9685	14.2664	14.5642	(38)
Heat transfer coeff	57.0304	56.8815	56.7326	55.9879	55.8390	55.0944	55.0944	54.9454	55.3922	55.8390	56.1369	56.4347	(39)
Average = Sum(39)m / 12 =												55.9507	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8121	0.8099	0.8078	0.7972	0.7951	0.7845	0.7845	0.7824	0.7887	0.7951	0.7993	0.8036	(40)
HLP (average)												0.7967	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2517 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.9732	61.0418	59.6847	57.0881	55.1718	53.0348	51.8202	53.1670	54.6434	56.9379	59.5903	61.7357	(42a)
Hot water usage for baths	26.7737	26.3761	25.8162	24.7837	24.0106	23.1534	22.6904	23.2464	23.8518	24.7691	25.8228	26.6832	(42b)
Hot water usage for other uses	37.6896	36.3191	34.9486	33.5780	32.2075	30.8370	30.8370	32.2075	33.5780	34.9486	36.3191	37.6896	(42c)
Average daily hot water use (litres/day)												116.2239	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.4365	123.7370	120.4494	115.4498	111.3899	107.0252	105.3475	108.6209	112.0733	116.6556	121.7322	126.1086	(44)
Energy conte	200.2446	176.1999	185.1263	158.0450	149.9523	131.6000	127.4087	134.4954	138.1976	158.3005	173.4298	197.4555	(45)
Energy content (annual)										Total = Sum(45)m =		1930.4555	
Distribution loss (46)m = 0.15 x (45)m	30.0367	26.4300	27.7689	23.7068	22.4928	19.7400	19.1113	20.1743	20.7296	23.7451	26.0145	29.6183	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(64)
										Total per year (kWh/year) = Sum(64)m =		2275.3805	(64)
12Total per year (kWh/year)												2275	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	66.5813	58.5865	61.5545	52.5500	49.8591	43.7570	42.3634	44.7197	45.9507	52.6349	57.6654	65.6540	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.7992	116.0277	104.7992	108.2925	104.7992	108.2925	104.7992	104.7992	108.2925	104.7992	108.2925	104.7992	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8333	199.8862	194.7130	183.6998	169.7976	156.7316	148.0027	145.9498	151.1230	162.1361	176.0383	189.1044	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	(71)
Water heating gains (Table 5)	89.4910	87.1822	82.7345	72.9861	67.0150	60.7736	56.9400	60.1072	63.8204	70.7459	80.0909	88.2446	(72)
Total internal gains	448.8989	459.8715	439.0221	421.7538	398.3872	382.5731	366.5173	367.6315	380.0113	394.4566	421.1971	438.9236	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

West				5.4200		19.6403		0.3300		0.0000		0.7700	27.0490 (80)
West				5.4500		19.6403		0.3300		0.0000		0.7700	27.1987 (80)
Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107 (83)	
Total gains	503.1466	565.9916	613.7867	676.6376	710.7569	702.3390	670.9475	629.1326	583.2698	520.3770	488.8376	483.5342 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.6811	67.8583	68.0364	68.9413	69.1252	70.0594	70.0594	70.2493	69.6827	69.1252	68.7584	68.3955	
alpha	5.5121	5.5239	5.5358	5.5961	5.6083	5.6706	5.6706	5.6833	5.6455	5.6083	5.5839	5.5597	
util living area	0.9858	0.9720	0.9411	0.8489	0.6919	0.4970	0.3606	0.4004	0.6332	0.8911	0.9712	0.9883 (86)	
MIT	20.0994	20.2782	20.5162	20.7959	20.9455	20.9929	20.9990	20.9983	20.9744	20.7682	20.3953	20.0703 (87)	
Th 2	20.2429	20.2447	20.2466	20.2558	20.2576	20.2668	20.2668	20.2686	20.2631	20.2576	20.2539	20.2502 (88)	
util rest of house	0.9825	0.9659	0.9285	0.8208	0.6467	0.4420	0.3009	0.3374	0.5732	0.8634	0.9638	0.9855 (89)	
MIT 2	19.1924	19.4185	19.7144	20.0514	20.2113	20.2623	20.2664	20.2679	20.2451	20.0288	19.5752	19.1612 (90)	
Living area fraction										fLA = Living area / (4) =		0.3699 (91)	
MIT	19.5280	19.7365	20.0110	20.3268	20.4829	20.5326	20.5374	20.5381	20.5149	20.3023	19.8786	19.4975 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5280	19.7365	20.0110	20.3268	20.4829	20.5326	20.5374	20.5381	20.5149	20.3023	19.8786	19.4975 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9609	0.9240	0.8236	0.6608	0.4621	0.3230	0.3607	0.5941	0.8652	0.9593	0.9821 (94)	
Useful gains	492.3931	543.8406	567.1215	557.3077	469.6656	324.5548	216.6866	226.9223	346.5461	450.2460	468.9543	474.8648 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	868.4570	843.9232	766.5123	639.7653	490.4278	326.8525	216.9300	227.3693	355.3346	541.7694	717.3499	863.3111 (97)	
Space heating kWh	279.7915	201.6555	148.3468	59.3694	15.4471	0.0000	0.0000	0.0000	0.0000	68.0934	178.8448	289.0040 (98a)	
Space heating requirement - total per year (kWh/year)												1240.5527	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	279.7915	201.6555	148.3468	59.3694	15.4471	0.0000	0.0000	0.0000	0.0000	68.0934	178.8448	289.0040 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1240.5527	
Space heating per m2											(98c) / (4) =	17.6641 (99)	

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	279.7915	201.6555	148.3468	59.3694	15.4471	0.0000	0.0000	0.0000	0.0000	68.0934	178.8448	289.0040 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	279.7915	201.6555	148.3468	59.3694	15.4471	0.0000	0.0000	0.0000	0.0000	68.0934	178.8448	289.0040 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505 (64)	
Efficiency of water heater												361.6650 (216)	
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)	
Fuel for water heating, kWh/month	63.4674	56.0352	59.2873	51.5380	49.5617	44.2260	43.3284	45.2879	46.0502	51.8700	55.7919	62.6963 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	10.2605	9.2676	10.2605	9.9296	10.2605	9.9296	10.2605	10.2605	9.9296	10.2605	9.9296	10.2605 (231)	
Lighting	21.3301	17.1118	15.4073	11.2880	8.7192	7.1237	7.9540	10.3389	13.4291	17.6198	19.9015	21.9230 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												1240.5527 (211)	

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	629.1404	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	120.8097	(230a)
Total electricity for the above, kWh/year	120.8097	(231)
Electricity for lighting (calculated in Appendix L)	172.1463	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2162.6491	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1240.5527	0.1568	194.4707	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	629.1404	0.1411	88.7992	(264)
Space and water heating			283.2699	(265)
Pumps, fans and electric keep-hot	120.8097	0.1387	16.7578	(267)
Energy for lighting	172.1463	0.1443	24.8460	(268)
Total CO2, kg/year			324.8738	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1240.5527	1.5803	1960.4914	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	629.1404	1.5219	957.4952	(278)
Space and water heating			2917.9866	(279)
Pumps, fans and electric keep-hot	120.8097	1.5128	182.7608	(281)
Energy for lighting	172.1463	1.5338	264.0438	(282)
Total Primary energy kWh/year			3364.7913	(286)
Dwelling Primary energy Rate (DPER)			47.9100	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.2300	(1b)	x 2.4000	(2b) =	168.5520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.5520	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1780	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4280	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3638	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)

Adj infilt rate												
	0.4638	0.4547	0.4456	0.4002	0.3911	0.3456	0.3456	0.3365	0.3638	0.3911	0.4093	0.4275 (22b)
Effective ac	0.6076	0.6034	0.5993	0.5801	0.5765	0.5597	0.5597	0.5566	0.5662	0.5765	0.5837	0.5914 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
Brickwork	29.7400	10.8700	18.8700	0.1800	3.3966			(29a)
Communal Wall	18.7300	2.0600	16.6700	0.1800	3.0006			(29a)
Lift Shaft Wall	9.7700		9.7700	0.1800	1.7586			(29a)
Terrace Roof	29.1600		29.1600	0.1100	3.2076			(30)
Cold Roof	41.0700		41.0700	0.1100	4.5177			(30)
Total net area of external elements Aum(A, m2)			128.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.3877			(33)
Main dwelling								
Party Wall 1			36.8100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	197.8580	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	17.1600	0.0700	1.2012
E18 Party wall between dwellings	8.2500	0.0600	0.4950
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0200	0.0200	0.0804
E15 Flat roof with parapet	8.4900	0.5600	4.7544
P4 Party wall - Roof (insulation at ceiling level)	13.4000	0.1200	1.6080
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0500	0.9245
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.9445	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.3322	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.7943	33.5620	33.3343	32.2646	32.0645	31.1328	31.1328	30.9603	31.4917	32.0645	32.4693	32.8926	(38)
Heat transfer coeff	78.1265	77.8942	77.6664	76.5967	76.3966	75.4650	75.4650	75.2924	75.8238	76.3966	76.8015	77.2247	(39)
Average = Sum(39)m / 12 =												76.5958	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1124	1.1091	1.1059	1.0907	1.0878	1.0745	1.0745	1.0721	1.0797	1.0878	1.0936	1.0996	(40)
HLP (average)												1.0906	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2517	(42)

Hot water usage for mixer showers

61.9732	61.0418	59.6847	57.0881	55.1718	53.0348	51.8202	53.1670	54.6434	56.9379	59.5903	61.7357	(42a)

Hot water usage for baths

26.7737	26.3761	25.8162	24.7837	24.0106	23.1534	22.6904	23.2464	23.8518	24.7691	25.8228	26.6832	(42b)

Hot water usage for other uses

37.6896	36.3191	34.9486	33.5780	32.2075	30.8370	30.8370	32.2075	33.5780	34.9486	36.3191	37.6896	(42c)

Average daily hot water use (litres/day)	116.2239	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.4365	123.7370	120.4494	115.4498	111.3899	107.0252	105.3475	108.6209	112.0733	116.6556	121.7322	126.1086	(44)
Energy conte	200.2446	176.1999	185.1263	158.0450	149.9523	131.6000	127.4087	134.4954	138.1976	158.3005	173.4298	197.4555	(45)
Energy content (annual)											Total = Sum(45)m =	1930.4555	

Distribution loss (46)m = 0.15 x (45)m

30.0367	26.4300	27.7689	23.7068	22.4928	19.7400	19.1113	20.1743	20.7296	23.7451	26.0145	29.6183	(46)

Water storage loss (or HIU loss):		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.7527	(55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

246.8395	218.2856	231.7212	203.1369	196.5472	176.6918	174.0036	181.0903	183.2894	204.8954	218.5217	244.0504	(62)
WWHRS -28.3316	-25.0567	-26.2379	-21.7260	-20.2479	-17.3262	-16.2406	-17.2702	-17.9264	-21.1332	-23.9414	-27.8069	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

218.5079	193.2289	205.4833	181.4109	176.2993	159.3656	157.7630	163.8201	165.3630	183.7622	194.5803	216.2435	(64)
									Total per year (kWh/year) = Sum(64)m =		2215.8280	(64)
12Total per year (kWh/year)											2216	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000	(64a)

Heat gains from water heating, kWh/month

103.8572	92.2550	98.8304	88.6234	87.1351	79.8305	79.6393	81.9956	82.0242	89.9108	93.7389	102.9299	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.7992	116.0277	104.7992	108.2925	104.7992	108.2925	104.7992	104.7992	108.2925	104.7992	108.2925	104.7992 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	197.8333	199.8862	194.7130	183.6998	169.7976	156.7316	148.0027	145.9498	151.1230	162.1361	176.0383	189.1044 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678 (71)

Water heating gains (Table 5)

	139.5931	137.2843	132.8366	123.0881	117.1170	110.8756	107.0421	110.2092	113.9225	120.8479	130.1929	138.3466 (72)

Total internal gains

	502.0010	512.9736	492.1241	474.8558	451.4893	432.6752	416.6194	417.7336	430.1134	447.5587	474.2991	492.0256 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	10.8700	19.6403	0.6300	0.7000	0.7700	65.2452	(80)

Solar gains	65.2452	127.6335	210.1942	306.5557	375.6955	384.5912	366.1465	314.5144	244.4645	151.4479	81.3531	53.6545 (83)
Total gains	567.2462	640.6070	702.3183	781.4115	827.1848	817.2663	782.7658	732.2480	674.5779	599.0066	555.6523	545.6801 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.4055	49.5529	49.6982	50.3922	50.5242	51.1480	51.1480	51.2652	50.9059	50.5242	50.2579	49.9824	
alpha	4.2937	4.3035	4.3132	4.3595	4.3683	4.4099	4.4099	4.4177	4.3937	4.3683	4.3505	4.3322	
util living area	0.9840	0.9720	0.9465	0.8756	0.7472	0.5657	0.4186	0.4637	0.6992	0.9082	0.9711	0.9863	(86)
MIT	19.6242	19.8356	20.1485	20.5507	20.8287	20.9617	20.9918	20.9874	20.9044	20.5358	20.0231	19.5970	(87)
Th 2	19.9907	19.9934	19.9960	20.0085	20.0108	20.0217	20.0217	20.0237	20.0175	20.0108	20.0061	20.0012	(88)
util rest of house	0.9800	0.9652	0.9334	0.8463	0.6935	0.4885	0.3282	0.3696	0.6234	0.8797	0.9629	0.9828	(89)
MIT 2	18.4065	18.6745	19.0662	19.5581	19.8651	19.9981	20.0186	20.0185	19.9504	19.5542	18.9229	18.3793	(90)
Living area fraction									fLA = Living area / (4) =			0.3699	(91)
MIT	18.8570	19.1040	19.4666	19.9253	20.2216	20.3545	20.3786	20.3769	20.3033	19.9174	19.3299	18.8298	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8570	19.1040	19.4666	19.9253	20.2216	20.3545	20.3786	20.3769	20.3033	19.9174	19.3299	18.8298	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9576	0.9250	0.8436	0.7057	0.5155	0.3616	0.4042	0.6467	0.8765	0.9557	0.9774	(94)
Useful gains	552.5312	613.4319	649.6533	659.1656	583.7032	421.3228	283.0329	295.9959	436.2825	525.0378	531.0462	533.3693	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1137.2842	1106.4094	1007.0683	844.5020	651.0190	434.2660	285.1523	299.4291	470.3576	711.8152	939.2725	1129.7799	(97)
Space heating kWh	435.0562	331.2809	265.9168	133.4422	50.0830	0.0000	0.0000	0.0000	0.0000	138.9624	293.9229	443.7295	(98a)
Space heating requirement - total per year (kWh/year)												2092.3938	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	435.0562	331.2809	265.9168	133.4422	50.0830	0.0000	0.0000	0.0000	0.0000	138.9624	293.9229	443.7295	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2092.3938	
Space heating per m2											(98c) / (4) =	29.7934	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	435.0562	331.2809	265.9168	133.4422	50.0830	0.0000	0.0000	0.0000	0.0000	138.9624	293.9229	443.7295	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	471.3502	358.9176	288.1005	144.5744	54.2611	0.0000	0.0000	0.0000	0.0000	150.5551	318.4431	480.7470	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	218.5079	193.2289	205.4833	181.4109	176.2993	159.3656	157.7630	163.8201	165.3630	183.7622	194.5803	216.2435	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5733	85.2576	84.6390	83.3817	81.6303	79.8000	79.8000	79.8000	79.8000	83.4415	84.9823	85.6355	(217)
Fuel for water heating, kWh/month	255.3458	226.6412	242.7761	217.5668	215.9728	199.7062	197.6980	205.2883	207.2219	220.2288	228.9656	252.5164	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7752	17.4689	15.7288	11.5236	8.9011	7.2723	8.1199	10.5546	13.7094	17.9874	20.3168	22.3804	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.8303	-27.9033	-42.1319	-49.8398	-55.9130	-52.9866	-52.3464	-48.3447	-41.6588	-32.9910	-21.1802	-16.1260 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.8774	-14.7798	-29.9661	-45.8842	-61.5352	-62.1437	-61.4067	-51.5887	-37.2900	-21.4141	-9.2708	-5.4150 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2266.9489	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2669.9280	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.7383	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-867.8235	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4330.7917	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2266.9489	0.2100	476.0593	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2669.9280	0.2100	560.6849	(264)
Space and water heating			1036.7441	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.7383	0.1443	25.3645	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-460.2519	0.1336	-61.4670	
PV Unit electricity exported	-407.5716	0.1253	-51.0835	
Total			-112.5504	(269)
Total CO2, kg/year			961.4874	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2266.9489	1.1300	2561.6522	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2669.9280	1.1300	3017.0186	(278)
Space and water heating			5578.6709	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.7383	1.5338	269.5533	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-460.2519	1.4935	-687.3963	
PV Unit electricity exported	-407.5716	0.4600	-187.5006	
Total			-874.8969	(283)
Total Primary energy kWh/year			5103.4281	(286)
Target Primary Energy Rate (TPER)			72.6700	(287)

Full SAP Calculation Printout

Plot Reference	P-19	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-19
Plot Address	Flat 15, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.63	**TER**	13.69
Environmental	96 A	**% DER < TER**			66.18
CO_2 Emissions (t/year)	0.26	**DFEE**	34.16	**TFEE**	37.10
Compliance Check	See BREL	**% DFEE < TFEE**			7.94
% DPER < TPER	34.07	**DPER**	47.91	**TPER**	72.67

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.2300	(1b)	x 2.4000	(2b) =	168.5520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	168.5520	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1780	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5200	(17)
Infiltration rate		0.3040	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2584	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3294	0.3230	0.3165	0.2842	0.2778	0.2455	0.2455	0.2390	0.2584	0.2778	0.2907	0.3036	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5543	0.5522	0.5501	0.5404	0.5386	0.5301	0.5301	0.5286	0.5334	0.5386	0.5422	0.5461	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	29.7400	10.8700	18.8700	0.2100	3.9627	110.0000	2075.7000	(29a)
Communal Wall	18.7300	2.0600	16.6700	0.2200	3.6674	110.0000	1833.6999	(29a)
Lift Shaft Wall	9.7700		9.7700	0.2100	2.0517	110.0000	1074.7001	(29a)
Terrace Roof	29.1600		29.1600	0.1300	3.7908	9.0000	262.4400	(30)
Cold Roof	41.0700		41.0700	0.0900	3.6963	9.0000	369.6300	(30)
Total net area of external elements Aum(A, m2)			128.4700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.0875			(33)
Main dwelling								
Party Wall 1			36.8100	0.0000	0.0000	110.0000	4049.1002	(32)
Party Floor 1			70.2300			40.0000	2809.2000	(32d)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13895.5701 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		197.8580 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.1600	0.0380	0.6521
E18 Party wall between dwellings	8.2500	0.0380	0.3135
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0200	0.3300	1.3266
E15 Flat roof with parapet	8.4900	0.3000	2.5470
P4 Party wall - Roof (insulation at ceiling level)	13.4000	0.1010	1.3534
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7830 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.8705 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.8295	30.7123	30.5974	30.0578	29.9568	29.4868	29.4868	29.3998	29.6679	29.9568	30.1611	30.3746	(38)
Heat transfer coeff	72.7000	72.5828	72.4679	71.9283	71.8273	71.3573	71.3573	71.2703	71.5384	71.8273	72.0316	72.2451	(39)
Average = Sum(39)m / 12 =												71.9278	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0352	1.0335	1.0319	1.0242	1.0227	1.0161	1.0161	1.0148	1.0186	1.0227	1.0257	1.0287	(40)
HLP (average)												1.0242	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2517 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.7737	26.3761	25.8162	24.7837	24.0106	23.1534	22.6904	23.2464	23.8518	24.7691	25.8228	26.6832	(42b)

Hot water usage for other uses

37.6896	36.3191	34.9486	33.5780	32.2075	30.8370	30.8370	32.2075	33.5780	34.9486	36.3191	37.6896	(42c)

Average daily hot water use (litres/day) 59.0867 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	64.4633	62.6952	60.7647	58.3617	56.2181	53.9904	53.5274	55.4539	57.4299	59.7176	62.1419	64.3728	(44)
Energy conte	102.0942	89.2771	93.3931	79.8943	75.6804	66.3875	64.7367	68.6635	70.8168	81.0363	88.5325	100.7923	(45)
Energy content (annual)										Total = Sum(45)m =		981.3046	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	86.7800	75.8855	79.3841	67.9102	64.3284	56.4294	55.0262	58.3640	60.1942	68.8808	75.2526	85.6734	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	86.7800	75.8855	79.3841	67.9102	64.3284	56.4294	55.0262	58.3640	60.1942	68.8808	75.2526	85.6734	(64)
										Total per year (kWh/year) = Sum(64)m =		834.1090	(64)
12Total per year (kWh/year)												834	(64)
Electric shower(s)	49.6302	44.2209	48.2875	46.0802	46.9449	44.7809	46.2736	46.9449	46.0802	48.2875	47.3795	49.6302	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		564.5405	(64a)
Heat gains from water heating, kWh/month	34.1026	30.0266	31.9179	28.4976	27.8183	25.3026	25.3249	26.3272	26.5686	29.2921	30.6580	33.8259	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.7992	116.0277	104.7992	108.2925	104.7992	108.2925	104.7992	104.7992	108.2925	104.7992	108.2925	104.7992	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8333	199.8862	194.7130	183.6998	169.7976	156.7316	148.0027	145.9498	151.1230	162.1361	176.0383	189.1044	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	(71)
Water heating gains (Table 5)	45.8368	44.6825	42.9004	39.5800	37.3902	35.1424	34.0389	35.3861	36.9009	39.3711	42.5806	45.4649	(72)
Total internal gains	405.2447	417.3717	399.1880	388.3477	368.7625	356.9420	343.6162	342.9104	353.0918	363.0819	383.6868	396.1439	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
West	5.4500	19.6403	0.3300	0.0000	0.7700	27.1987	(80)

Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107	(83)
Total gains	459.4924	523.4918	573.9526	643.2315	681.1321	676.7079	648.0464	604.4115	556.3502	489.0023	451.3274	440.7546	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.0933	53.1790	53.2633	53.6629	53.7383	54.0923	54.0923	54.1583	53.9554	53.7383	53.5860	53.4276	
alpha	4.5396	4.5453	4.5509	4.5775	4.5826	4.6062	4.6062	4.6106	4.5970	4.5826	4.5724	4.5618	
util living area	0.9924	0.9855	0.9700	0.9198	0.8128	0.6346	0.4755	0.5271	0.7690	0.9453	0.9855	0.9937	(86)
MIT	19.5788	19.7760	20.0731	20.4762	20.7850	20.9486	20.9890	20.9826	20.8762	20.4647	19.9546	19.5436	(87)
Th 2	20.0541	20.0555	20.0569	20.0632	20.0644	20.0700	20.0700	20.0710	20.0678	20.0644	20.0620	20.0595	(88)
util rest of house	0.9905	0.9818	0.9621	0.8985	0.7659	0.5565	0.3793	0.4277	0.6990	0.9263	0.9811	0.9921	(89)
MIT 2	18.7602	18.9564	19.2497	19.6403	19.9156	20.0441	20.0665	20.0651	19.9962	19.6379	19.1398	18.7293	(90)
Living area fraction										fLA = Living area / (4) =		0.3699	(91)
MIT	19.0630	19.2596	19.5543	19.9495	20.2372	20.3787	20.4078	20.4045	20.3218	19.9438	19.4412	19.0306	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0630	19.2596	19.5543	19.9495	20.2372	20.3787	20.4078	20.4045	20.3218	19.9438	19.4412	19.0306	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9877	0.9778	0.9568	0.8955	0.7753	0.5834	0.4148	0.4642	0.7196	0.9233	0.9773	0.9897	(94)
Useful gains	453.8556	511.8447	549.1818	576.0046	528.0477	394.8152	268.8114	280.5934	400.3423	451.4957	441.0777	436.2116	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1073.2729	1042.2579	946.0172	794.7748	613.2061	412.3554	271.7128	285.4012	445.0950	671.1390	888.9554	1071.4362	(97)
Space heating kWh	460.8465	356.4376	295.2455	157.5146	63.3579	0.0000	0.0000	0.0000	0.0000	163.4147	322.4720	472.6071	(98a)
Space heating requirement - total per year (kWh/year)												2291.8958	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	460.8465	356.4376	295.2455	157.5146	63.3579	0.0000	0.0000	0.0000	0.0000	163.4147	322.4720	472.6071	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2291.8958	
Space heating per m2											(98c) / (4) =	32.6341	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	670.7589	528.0442	541.6542	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8632	0.9213	0.8958	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	578.9928	486.4777	485.2018	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	747.7878	716.4696	667.5466	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	121.5324	171.1140	135.6645	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	30.3831	42.7785	33.9161	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												107.0777	(107)
Energy for space heating												32.6341	(99)
Energy for space cooling												1.5247	(108)
Total												34.1588	(109)
Fabric Energy Efficiency (DFEE)												34.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		70.2300	(1b)	x 2.4000	(2b) =	168.5520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		168.5520	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)

Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1780 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.4280 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3638 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4638	0.4547	0.4456	0.4002	0.3911	0.3456	0.3456	0.3365	0.3638	0.3911	0.4093	0.4275	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.6076	0.6034	0.5993	0.5801	0.5765	0.5597	0.5597	0.5566	0.5662	0.5765	0.5837	0.5914	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
Brickwork	29.7400	10.8700	18.8700	0.1800	3.3966			(29a)
Communal Wall	18.7300	2.0600	16.6700	0.1800	3.0006			(29a)
Lift Shaft Wall	9.7700		9.7700	0.1800	1.7586			(29a)
Terrace Roof	29.1600		29.1600	0.1100	3.2076			(30)
Cold Roof	41.0700		41.0700	0.1100	4.5177			(30)
Total net area of external elements Aum(A, m2)			128.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.3877			(33)
Main dwelling								
Party Wall 1			36.8100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 197.8580 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.1600	0.0700	1.2012
E18 Party wall between dwellings	8.2500	0.0600	0.4950
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0200	0.0200	0.0804
E15 Flat roof with parapet	8.4900	0.5600	4.7544
P4 Party wall - Roof (insulation at ceiling level)	13.4000	0.1200	1.6080
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0500	0.9245
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9445 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.3322 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.7943	33.5620	33.3343	32.2646	32.0645	31.1328	31.1328	30.9603	31.4917	32.0645	32.4693	32.8926	(38)
Heat transfer coeff	78.1265	77.8942	77.6664	76.5967	76.3966	75.4650	75.4650	75.2924	75.8238	76.3966	76.8015	77.2247	(39)

Average = Sum(39)m / 12 = 76.5958

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1124	1.1091	1.1059	1.0907	1.0878	1.0745	1.0745	1.0721	1.0797	1.0878	1.0936	1.0996	(40)
HLP (average)												1.0906	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2517 (42)
Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	26.7737	26.3761	25.8162	24.7837	24.0106	23.1534	22.6904	23.2464	23.8518	24.7691	25.8228	26.6832	(42b)

Hot water usage for other uses

	37.6896	36.3191	34.9486	33.5780	32.2075	30.8370	30.8370	32.2075	33.5780	34.9486	36.3191	37.6896	(42c)

Average daily hot water use (litres/day) 59.0867 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	64.4633	62.6952	60.7647	58.3617	56.2181	53.9904	53.5274	55.4539	57.4299	59.7176	62.1419	64.3728	(44)
Energy conte	102.0942	89.2771	93.3931	79.8943	75.6804	66.3875	64.7367	68.6635	70.8168	81.0363	88.5325	100.7923	(45)

Energy content (annual) Total = Sum(45)m = 981.3046

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	86.7800	75.8855	79.3841	67.9102	64.3284	56.4294	55.0262	58.3640	60.1942	68.8808	75.2526	85.6734	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	86.7800	75.8855	79.3841	67.9102	64.3284	56.4294	55.0262	58.3640	60.1942	68.8808	75.2526	85.6734	(64)

Total per year (kWh/year) = Sum(64)m = 834.1090 (64)

12Total per year (kWh/year) 834 (64)

Electric shower(s)

	49.6302	44.2209	48.2875	46.0802	46.9449	44.7809	46.2736	46.9449	46.0802	48.2875	47.3795	49.6302 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 564.5405 (64a)

Heat gains from water heating, kWh/month

	34.1026	30.0266	31.9179	28.4976	27.8183	25.3026	25.3249	26.3272	26.5686	29.2921	30.6580	33.8259 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.7992	116.0277	104.7992	108.2925	104.7992	108.2925	104.7992	104.7992	108.2925	104.7992	108.2925	104.7992	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	197.8333	199.8862	194.7130	183.6998	169.7976	156.7316	148.0027	145.9498	151.1230	162.1361	176.0383	189.1044	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	(71)

Water heating gains (Table 5)

	45.8368	44.6825	42.9004	39.5800	37.3902	35.1424	34.0389	35.3861	36.9009	39.3711	42.5806	45.4649	(72)

Total internal gains

	405.2447	417.3717	399.1880	388.3477	368.7625	356.9420	343.6162	342.9104	353.0918	363.0819	383.6868	396.1439	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	10.8700	19.6403	0.6300	0.7000	0.7700	65.2452	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	65.2452	127.6335	210.1942	306.5557	375.6955	384.5912	366.1465	314.5144	244.4645	151.4479	81.3531	53.6545	(83)
Total gains	470.4899	545.0052	609.3822	694.9034	744.4579	741.5331	709.7627	657.4249	597.5563	514.5298	465.0400	449.7984	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.4055	49.5529	49.6982	50.3922	50.5242	51.1480	51.1480	51.2652	50.9059	50.5242	50.2579	49.9824	
alpha	4.2937	4.3035	4.3132	4.3595	4.3683	4.4099	4.4099	4.4177	4.3937	4.3683	4.3505	4.3322	
util living area	0.9920	0.9841	0.9663	0.9093	0.7942	0.6133	0.4589	0.5117	0.7568	0.9415	0.9846	0.9933	(86)
MIT	19.4557	19.6764	20.0083	20.4539	20.7791	20.9476	20.9883	20.9815	20.8683	20.4254	19.8718	19.4281	(87)
Th 2	19.9907	19.9934	19.9960	20.0085	20.0108	20.0217	20.0217	20.0237	20.0175	20.0108	20.0061	20.0012	(88)
util rest of house	0.9898	0.9800	0.9573	0.8855	0.7439	0.5330	0.3611	0.4100	0.6834	0.9209	0.9799	0.9916	(89)
MIT 2	18.5899	18.8102	19.1381	19.5723	19.8605	19.9959	20.0181	20.0175	19.9426	19.5567	19.0151	18.5704	(90)
Living area fraction									fLA = Living area / (4) =			0.3699	(91)
MIT	18.9102	19.1307	19.4601	19.8984	20.2003	20.3480	20.3770	20.3741	20.2850	19.8780	19.3321	18.8877	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9102	19.1307	19.4601	19.8984	20.2003	20.3480	20.3770	20.3741	20.2850	19.8780	19.3321	18.8877	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9868	0.9755	0.9513	0.8825	0.7543	0.5608	0.3973	0.4474	0.7050	0.9176	0.9757	0.9889	(94)
Useful gains	464.2793	531.6447	579.7166	613.2246	561.5461	415.8645	281.9582	294.1140	421.2571	472.1342	453.7572	444.8256	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1141.4406	1108.4848	1006.5608	842.4447	649.3940	433.7694	285.0326	299.2217	468.9731	708.8113	939.4400	1134.2510	(97)
Space heating kWh	503.8080	387.6366	317.5721	165.0384	65.3588	0.0000	0.0000	0.0000	0.0000	176.0877	349.6917	512.9325	(98a)

Space heating requirement - total per year (kWh/year) 2478.1258

Solar heating kWh

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	503.8080	387.6366	317.5721	165.0384	65.3588	0.0000	0.0000	0.0000	0.0000	176.0877	349.6917	512.9325	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2478.1258

Space heating per m2 (98c) / (4) = 35.2859 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	709.3707	558.4408	572.2226	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8704	0.9246	0.8992	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	617.4465	516.3564	514.5490	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	823.5576	788.6056	729.5103	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	148.4000	202.5534	159.9313	0.0000	0.0000	0.0000	0.0000	(104)

Cooled fraction fC = cooled area / (4) = 1.0000 (105)

Intermittency factor (Table 10b)

	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.1000	50.6384	39.9828	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement 127.7212 (107)

Energy for space heating	35.2859 (99)
Energy for space cooling	1.8186 (108)
Total	37.1045 (109)
Fabric Energy Efficiency (TFEE)	37.1 (109)

Full SAP Calculation Printout

Plot Reference	P-19	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-19
Plot Address	Flat 15, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.63	**TER**	13.69
Environmental	96 A	**% DER < TER**			66.18
CO_2 Emissions (t/year)	0.26	**DFEE**	34.16	**TFEE**	37.10
Compliance Check	See BREL	**% DFEE < TFEE**			7.94
% DPER < TPER	34.07	**DPER**	47.91	**TPER**	72.67

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.2300	(1b)	x 2.4000	(2b) =	168.5520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	168.5520	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5200	(17)
Infiltration rate		0.1260	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1071	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1366	0.1339	0.1312	0.1178	0.1151	0.1017	0.1017	0.0991	0.1071	0.1151	0.1205	0.1258	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2726	0.2699	0.2672	0.2538	0.2511	0.2377	0.2377	0.2351	0.2431	0.2511	0.2565	0.2618	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	29.7400	10.8700	18.8700	0.2100	3.9627	110.0000	2075.7000	(29a)
Communal Wall	18.7300	2.0600	16.6700	0.2200	3.6674	110.0000	1833.6999	(29a)
Lift Shaft Wall	9.7700		9.7700	0.2100	2.0517	110.0000	1074.7001	(29a)
Terrace Roof	29.1600		29.1600	0.1300	3.7908	9.0000	262.4400	(30)
Cold Roof	41.0700		41.0700	0.0900	3.6963	9.0000	369.6300	(30)
Total net area of external elements Aum(A, m2)			128.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0875			(33)
Main dwelling								
Party Wall 1			36.8100	0.0000	0.0000	110.0000	4049.1002	(32)
Party Floor 1			70.2300			40.0000	2809.2000	(32d)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13895.5701 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 197.8580 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	17.1600	0.0380	0.6521
E18 Party wall between dwellings	8.2500	0.0380	0.3135
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0200	0.3300	1.3266
E15 Flat roof with parapet	8.4900	0.3000	2.5470
P4 Party wall - Roof (insulation at ceiling level)	13.4000	0.1010	1.3534
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7830 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.8705 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.1600	15.0110	14.8621	14.1175	13.9685	13.2239	13.2239	13.0750	13.5217	13.9685	14.2664	14.5642	(38)
Heat transfer coeff	57.0304	56.8815	56.7326	55.9879	55.8390	55.0944	55.0944	54.9454	55.3922	55.8390	56.1369	56.4347	(39)
Average = Sum(39)m / 12 =												55.9507	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8121	0.8099	0.8078	0.7972	0.7951	0.7845	0.7845	0.7824	0.7887	0.7951	0.7993	0.8036	(40)
HLP (average)												0.7967	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2517 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.9732	61.0418	59.6847	57.0881	55.1718	53.0348	51.8202	53.1670	54.6434	56.9379	59.5903	61.7357	(42a)
Hot water usage for baths	26.7737	26.3761	25.8162	24.7837	24.0106	23.1534	22.6904	23.2464	23.8518	24.7691	25.8228	26.6832	(42b)
Hot water usage for other uses	37.6896	36.3191	34.9486	33.5780	32.2075	30.8370	30.8370	32.2075	33.5780	34.9486	36.3191	37.6896	(42c)
Average daily hot water use (litres/day)												116.2239	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.4365	123.7370	120.4494	115.4498	111.3899	107.0252	105.3475	108.6209	112.0733	116.6556	121.7322	126.1086	(44)
Energy conte	200.2446	176.1999	185.1263	158.0450	149.9523	131.6000	127.4087	134.4954	138.1976	158.3005	173.4298	197.4555	(45)
Energy content (annual)										Total = Sum(45)m =		1930.4555	
Distribution loss (46)m = 0.15 x (45)m	30.0367	26.4300	27.7689	23.7068	22.4928	19.7400	19.1113	20.1743	20.7296	23.7451	26.0145	29.6183	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(64)
										Total per year (kWh/year) = Sum(64)m =		2275.3805	(64)
12Total per year (kWh/year)												2275	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	66.5813	58.5865	61.5545	52.5500	49.8591	43.7570	42.3634	44.7197	45.9507	52.6349	57.6654	65.6540	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.7992	116.0277	104.7992	108.2925	104.7992	108.2925	104.7992	104.7992	108.2925	104.7992	108.2925	104.7992	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.8333	199.8862	194.7130	183.6998	169.7976	156.7316	148.0027	145.9498	151.1230	162.1361	176.0383	189.1044	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	(71)
Water heating gains (Table 5)	89.4910	87.1822	82.7345	72.9861	67.0150	60.7736	56.9400	60.1072	63.8204	70.7459	80.0909	88.2446	(72)
Total internal gains	448.8989	459.8715	439.0221	421.7538	398.3872	382.5731	366.5173	367.6315	380.0113	394.4566	421.1971	438.9236	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

West				5.4200		19.6403		0.3300		0.0000		0.7700	27.0490 (80)
West				5.4500		19.6403		0.3300		0.0000		0.7700	27.1987 (80)
Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107 (83)	
Total gains	503.1466	565.9916	613.7867	676.6376	710.7569	702.3390	670.9475	629.1326	583.2698	520.3770	488.8376	483.5342 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.6811	67.8583	68.0364	68.9413	69.1252	70.0594	70.0594	70.2493	69.6827	69.1252	68.7584	68.3955	
alpha	5.5121	5.5239	5.5358	5.5961	5.6083	5.6706	5.6706	5.6833	5.6455	5.6083	5.5839	5.5597	
util living area	0.9858	0.9720	0.9411	0.8489	0.6919	0.4970	0.3606	0.4004	0.6332	0.8911	0.9712	0.9883 (86)	
MIT	20.0994	20.2782	20.5162	20.7959	20.9455	20.9929	20.9990	20.9983	20.9744	20.7682	20.3953	20.0703 (87)	
Th 2	20.2429	20.2447	20.2466	20.2558	20.2576	20.2668	20.2668	20.2686	20.2631	20.2576	20.2539	20.2502 (88)	
util rest of house	0.9825	0.9659	0.9285	0.8208	0.6467	0.4420	0.3009	0.3374	0.5732	0.8634	0.9638	0.9855 (89)	
MIT 2	19.1924	19.4185	19.7144	20.0514	20.2113	20.2623	20.2664	20.2679	20.2451	20.0288	19.5752	19.1612 (90)	
Living area fraction										fLA = Living area / (4) =		0.3699 (91)	
MIT	19.5280	19.7365	20.0110	20.3268	20.4829	20.5326	20.5374	20.5381	20.5149	20.3023	19.8786	19.4975 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5280	19.7365	20.0110	20.3268	20.4829	20.5326	20.5374	20.5381	20.5149	20.3023	19.8786	19.4975 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9609	0.9240	0.8236	0.6608	0.4621	0.3230	0.3607	0.5941	0.8652	0.9593	0.9821 (94)	
Useful gains	492.3931	543.8406	567.1215	557.3077	469.6656	324.5548	216.6866	226.9223	346.5461	450.2460	468.9543	474.8648 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	868.4570	843.9232	766.5123	639.7653	490.4278	326.8525	216.9300	227.3693	355.3346	541.7694	717.3499	863.3111 (97)	
Space heating kWh	279.7915	201.6555	148.3468	59.3694	15.4471	0.0000	0.0000	0.0000	0.0000	68.0934	178.8448	289.0040 (98a)	
Space heating requirement - total per year (kWh/year)												1240.5527	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	279.7915	201.6555	148.3468	59.3694	15.4471	0.0000	0.0000	0.0000	0.0000	68.0934	178.8448	289.0040 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1240.5527	
Space heating per m2											(98c) / (4) =	17.6641 (99)	

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	279.7915	201.6555	148.3468	59.3694	15.4471	0.0000	0.0000	0.0000	0.0000	68.0934	178.8448	289.0040 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	279.7915	201.6555	148.3468	59.3694	15.4471	0.0000	0.0000	0.0000	0.0000	68.0934	178.8448	289.0040 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505 (64)	
Efficiency of water heater												361.6650 (216)	
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)	
Fuel for water heating, kWh/month	63.4674	56.0352	59.2873	51.5380	49.5617	44.2260	43.3284	45.2879	46.0502	51.8700	55.7919	62.6963 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	10.2605	9.2676	10.2605	9.9296	10.2605	9.9296	10.2605	10.2605	9.9296	10.2605	9.9296	10.2605 (231)	
Lighting	21.3301	17.1118	15.4073	11.2880	8.7192	7.1237	7.9540	10.3389	13.4291	17.6198	19.9015	21.9230 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												1240.5527 (211)	

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	629.1404	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	120.8097	(230a)
Total electricity for the above, kWh/year	120.8097	(231)
Electricity for lighting (calculated in Appendix L)	172.1463	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2162.6491	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1240.5527	0.1568	194.4707	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	629.1404	0.1411	88.7992	(264)
Space and water heating			283.2699	(265)
Pumps, fans and electric keep-hot	120.8097	0.1387	16.7578	(267)
Energy for lighting	172.1463	0.1443	24.8460	(268)
Total CO2, kg/year			324.8738	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1240.5527	1.5803	1960.4914	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	629.1404	1.5219	957.4952	(278)
Space and water heating			2917.9866	(279)
Pumps, fans and electric keep-hot	120.8097	1.5128	182.7608	(281)
Energy for lighting	172.1463	1.5338	264.0438	(282)
Total Primary energy kWh/year			3364.7913	(286)
Dwelling Primary energy Rate (DPER)			47.9100	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.2300	(1b)	x 2.4000	(2b) =	168.5520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.5520	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1780	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4280	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3638	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)

Adj infilt rate												
	0.4638	0.4547	0.4456	0.4002	0.3911	0.3456	0.3456	0.3365	0.3638	0.3911	0.4093	0.4275 (22b)
Effective ac	0.6076	0.6034	0.5993	0.5801	0.5765	0.5597	0.5597	0.5566	0.5662	0.5765	0.5837	0.5914 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8700	1.1450	12.4466			(27)
Brickwork	29.7400	10.8700	18.8700	0.1800	3.3966			(29a)
Communal Wall	18.7300	2.0600	16.6700	0.1800	3.0006			(29a)
Lift Shaft Wall	9.7700		9.7700	0.1800	1.7586			(29a)
Terrace Roof	29.1600		29.1600	0.1100	3.2076			(30)
Cold Roof	41.0700		41.0700	0.1100	4.5177			(30)
Total net area of external elements Aum(A, m2)			128.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.3877			(33)
Main dwelling								
Party Wall 1			36.8100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	197.8580	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	17.1600	0.0700	1.2012
E18 Party wall between dwellings	8.2500	0.0600	0.4950
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0200	0.0200	0.0804
E15 Flat roof with parapet	8.4900	0.5600	4.7544
P4 Party wall - Roof (insulation at ceiling level)	13.4000	0.1200	1.6080
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0500	0.9245
E16 Corner (normal)	8.5500	0.0900	0.7695
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.9445	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.3322	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.7943	33.5620	33.3343	32.2646	32.0645	31.1328	31.1328	30.9603	31.4917	32.0645	32.4693	32.8926	(38)
Heat transfer coeff	78.1265	77.8942	77.6664	76.5967	76.3966	75.4650	75.4650	75.2924	75.8238	76.3966	76.8015	77.2247	(39)
Average = Sum(39)m / 12 =												76.5958	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1124	1.1091	1.1059	1.0907	1.0878	1.0745	1.0745	1.0721	1.0797	1.0878	1.0936	1.0996	(40)
HLP (average)												1.0906	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2517	(42)

Hot water usage for mixer showers

61.9732	61.0418	59.6847	57.0881	55.1718	53.0348	51.8202	53.1670	54.6434	56.9379	59.5903	61.7357	(42a)

Hot water usage for baths

26.7737	26.3761	25.8162	24.7837	24.0106	23.1534	22.6904	23.2464	23.8518	24.7691	25.8228	26.6832	(42b)

Hot water usage for other uses

37.6896	36.3191	34.9486	33.5780	32.2075	30.8370	30.8370	32.2075	33.5780	34.9486	36.3191	37.6896	(42c)

Average daily hot water use (litres/day)	116.2239	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.4365	123.7370	120.4494	115.4498	111.3899	107.0252	105.3475	108.6209	112.0733	116.6556	121.7322	126.1086	(44)
Energy conte	200.2446	176.1999	185.1263	158.0450	149.9523	131.6000	127.4087	134.4954	138.1976	158.3005	173.4298	197.4555	(45)
Energy content (annual)											Total = Sum(45)m =	1930.4555	

Distribution loss (46)m = 0.15 x (45)m

30.0367	26.4300	27.7689	23.7068	22.4928	19.7400	19.1113	20.1743	20.7296	23.7451	26.0145	29.6183	(46)

Water storage loss (or HIU loss):		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.7527	(55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

246.8395	218.2856	231.7212	203.1369	196.5472	176.6918	174.0036	181.0903	183.2894	204.8954	218.5217	244.0504	(62)
WWHRS -28.3316	-25.0567	-26.2379	-21.7260	-20.2479	-17.3262	-16.2406	-17.2702	-17.9264	-21.1332	-23.9414	-27.8069	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

218.5079	193.2289	205.4833	181.4109	176.2993	159.3656	157.7630	163.8201	165.3630	183.7622	194.5803	216.2435	(64)
									Total per year (kWh/year) = Sum(64)m =		2215.8280	(64)
12Total per year (kWh/year)											2216	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000	(64a)

Heat gains from water heating, kWh/month

103.8572	92.2550	98.8304	88.6234	87.1351	79.8305	79.6393	81.9956	82.0242	89.9108	93.7389	102.9299	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	112.5848	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.7992	116.0277	104.7992	108.2925	104.7992	108.2925	104.7992	104.7992	108.2925	104.7992	108.2925	104.7992 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	197.8333	199.8862	194.7130	183.6998	169.7976	156.7316	148.0027	145.9498	151.1230	162.1361	176.0383	189.1044 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585	34.2585 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678 (71)

Water heating gains (Table 5)

	139.5931	137.2843	132.8366	123.0881	117.1170	110.8756	107.0421	110.2092	113.9225	120.8479	130.1929	138.3466 (72)

Total internal gains

	502.0010	512.9736	492.1241	474.8558	451.4893	432.6752	416.6194	417.7336	430.1134	447.5587	474.2991	492.0256 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	10.8700	19.6403	0.6300	0.7000	0.7700	65.2452	(80)

Solar gains	65.2452	127.6335	210.1942	306.5557	375.6955	384.5912	366.1465	314.5144	244.4645	151.4479	81.3531	53.6545 (83)
Total gains	567.2462	640.6070	702.3183	781.4115	827.1848	817.2663	782.7658	732.2480	674.5779	599.0066	555.6523	545.6801 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.4055	49.5529	49.6982	50.3922	50.5242	51.1480	51.1480	51.2652	50.9059	50.5242	50.2579	49.9824	
alpha	4.2937	4.3035	4.3132	4.3595	4.3683	4.4099	4.4099	4.4177	4.3937	4.3683	4.3505	4.3322	
util living area	0.9840	0.9720	0.9465	0.8756	0.7472	0.5657	0.4186	0.4637	0.6992	0.9082	0.9711	0.9863	(86)
MIT	19.6242	19.8356	20.1485	20.5507	20.8287	20.9617	20.9918	20.9874	20.9044	20.5358	20.0231	19.5970	(87)
Th 2	19.9907	19.9934	19.9960	20.0085	20.0108	20.0217	20.0217	20.0237	20.0175	20.0108	20.0061	20.0012	(88)
util rest of house	0.9800	0.9652	0.9334	0.8463	0.6935	0.4885	0.3282	0.3696	0.6234	0.8797	0.9629	0.9828	(89)
MIT 2	18.4065	18.6745	19.0662	19.5581	19.8651	19.9981	20.0186	20.0185	19.9504	19.5542	18.9229	18.3793	(90)
Living area fraction									fLA = Living area / (4) =			0.3699	(91)
MIT	18.8570	19.1040	19.4666	19.9253	20.2216	20.3545	20.3786	20.3769	20.3033	19.9174	19.3299	18.8298	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8570	19.1040	19.4666	19.9253	20.2216	20.3545	20.3786	20.3769	20.3033	19.9174	19.3299	18.8298	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9576	0.9250	0.8436	0.7057	0.5155	0.3616	0.4042	0.6467	0.8765	0.9557	0.9774	(94)
Useful gains	552.5312	613.4319	649.6533	659.1656	583.7032	421.3228	283.0329	295.9959	436.2825	525.0378	531.0462	533.3693	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1137.2842	1106.4094	1007.0683	844.5020	651.0190	434.2660	285.1523	299.4291	470.3576	711.8152	939.2725	1129.7799	(97)
Space heating kWh	435.0562	331.2809	265.9168	133.4422	50.0830	0.0000	0.0000	0.0000	0.0000	138.9624	293.9229	443.7295	(98a)
Space heating requirement - total per year (kWh/year)												2092.3938	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	435.0562	331.2809	265.9168	133.4422	50.0830	0.0000	0.0000	0.0000	0.0000	138.9624	293.9229	443.7295	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2092.3938	
Space heating per m2											(98c) / (4) =	29.7934	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	435.0562	331.2809	265.9168	133.4422	50.0830	0.0000	0.0000	0.0000	0.0000	138.9624	293.9229	443.7295	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	471.3502	358.9176	288.1005	144.5744	54.2611	0.0000	0.0000	0.0000	0.0000	150.5551	318.4431	480.7470	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	218.5079	193.2289	205.4833	181.4109	176.2993	159.3656	157.7630	163.8201	165.3630	183.7622	194.5803	216.2435	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5733	85.2576	84.6390	83.3817	81.6303	79.8000	79.8000	79.8000	79.8000	83.4415	84.9823	85.6355	(217)
Fuel for water heating, kWh/month	255.3458	226.6412	242.7761	217.5668	215.9728	199.7062	197.6980	205.2883	207.2219	220.2288	228.9656	252.5164	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7752	17.4689	15.7288	11.5236	8.9011	7.2723	8.1199	10.5546	13.7094	17.9874	20.3168	22.3804	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.8303	-27.9033	-42.1319	-49.8398	-55.9130	-52.9866	-52.3464	-48.3447	-41.6588	-32.9910	-21.1802	-16.1260 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.8774	-14.7798	-29.9661	-45.8842	-61.5352	-62.1437	-61.4067	-51.5887	-37.2900	-21.4141	-9.2708	-5.4150 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2266.9489	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2669.9280	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.7383	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-867.8235	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4330.7917	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2266.9489	0.2100	476.0593	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2669.9280	0.2100	560.6849	(264)
Space and water heating			1036.7441	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.7383	0.1443	25.3645	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-460.2519	0.1336	-61.4670	
PV Unit electricity exported	-407.5716	0.1253	-51.0835	
Total			-112.5504	(269)
Total CO2, kg/year			961.4874	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2266.9489	1.1300	2561.6522	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2669.9280	1.1300	3017.0186	(278)
Space and water heating			5578.6709	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.7383	1.5338	269.5533	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-460.2519	1.4935	-687.3963	
PV Unit electricity exported	-407.5716	0.4600	-187.5006	
Total			-874.8969	(283)
Total Primary energy kWh/year			5103.4281	(286)
Target Primary Energy Rate (TPER)			72.6700	(287)

Full SAP Calculation Printout

Plot Reference	P-19	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-19
Plot Address	Flat 15, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.63	**TER**	13.69
Environmental	96 A	**% DER < TER**			66.18
CO_2 Emissions (t/year)	0.26	**DFEE**	34.16	**TFEE**	37.10
Compliance Check	See BREL	**% DFEE < TFEE**			7.94
% DPER < TPER	34.07	**DPER**	47.91	**TPER**	72.67

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.2300	(1b)	x 2.4000	(2b) =	168.5520	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2300					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.5520	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5200 (17)
Infiltration rate		0.1260 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1071 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1366	0.1339	0.1312	0.1178	0.1151	0.1017	0.1017	0.0991	0.1071	0.1151	0.1205	0.1258	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2726	0.2699	0.2672	0.2538	0.2511	0.2377	0.2377	0.2351	0.2431	0.2511	0.2565	0.2618	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	29.7400	10.8700	18.8700	0.2100	3.9627	110.0000	2075.7000	(29a)
Communal Wall	18.7300	2.0600	16.6700	0.2200	3.6674	110.0000	1833.6999	(29a)
Lift Shaft Wall	9.7700		9.7700	0.2100	2.0517	110.0000	1074.7001	(29a)
Terrace Roof	29.1600		29.1600	0.1300	3.7908	9.0000	262.4400	(30)
Cold Roof	41.0700		41.0700	0.0900	3.6963	9.0000	369.6300	(30)
Total net area of external elements Aum(A, m2)			128.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0875			(33)
Main dwelling								
Party Wall 1			36.8100	0.0000	0.0000	110.0000	4049.1002	(32)
Party Floor 1			70.2300			40.0000	2809.2000	(32d)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13895.5701 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 197.8580 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	17.1600	0.0380	0.6521
E18 Party wall between dwellings	8.2500	0.0380	0.3135
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0200	0.3300	1.3266
E15 Flat roof with parapet	8.4900	0.3000	2.5470
P4 Party wall - Roof (insulation at ceiling level)	13.4000	0.1010	1.3534
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7830 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.8705 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.1600	15.0110	14.8621	14.1175	13.9685	13.2239	13.2239	13.0750	13.5217	13.9685	14.2664	14.5642	(38)
Heat transfer coeff	57.0304	56.8815	56.7326	55.9879	55.8390	55.0944	55.0944	54.9454	55.3922	55.8390	56.1369	56.4347	(39)
Average = Sum(39)m / 12 =												55.9507	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8121	0.8099	0.8078	0.7972	0.7951	0.7845	0.7845	0.7824	0.7887	0.7951	0.7993	0.8036	(40)
HLP (average)												0.7967	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2517 (42)
Hot water usage for mixer showers

61.9732	61.0418	59.6847	57.0881	55.1718	53.0348	51.8202	53.1670	54.6434	56.9379	59.5903	61.7357	(42a)

Hot water usage for baths

26.7737	26.3761	25.8162	24.7837	24.0106	23.1534	22.6904	23.2464	23.8518	24.7691	25.8228	26.6832	(42b)

Hot water usage for other uses

37.6896	36.3191	34.9486	33.5780	32.2075	30.8370	30.8370	32.2075	33.5780	34.9486	36.3191	37.6896	(42c)

Average daily hot water use (litres/day) 116.2239 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.4365	123.7370	120.4494	115.4498	111.3899	107.0252	105.3475	108.6209	112.0733	116.6556	121.7322	126.1086	(44)
Energy conte	200.2446	176.1999	185.1263	158.0450	149.9523	131.6000	127.4087	134.4954	138.1976	158.3005	173.4298	197.4555	(45)
Energy content (annual)										Total = Sum(45)m =		1930.4555	

Distribution loss (46)m = 0.15 x (45)m

30.0367	26.4300	27.7689	23.7068	22.4928	19.7400	19.1113	20.1743	20.7296	23.7451	26.0145	29.6183	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(64)
									Total per year (kWh/year) = Sum(64)m =		2275.3805	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

66.5813	58.5865	61.5545	52.5500	49.8591	43.7570	42.3634	44.7197	45.9507	52.6349	57.6654	65.6540	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3691	21.6444	17.6024	13.3262	9.9615	8.4099	9.0872	11.8119	15.8539	20.1301	23.4948	25.0464	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.2736	298.3376	290.6164	274.1788	253.4293	233.9277	220.8995	217.8355	225.5567	241.9943	262.7437	282.2453	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	(71)
Water heating gains (Table 5)	89.4910	87.1822	82.7345	72.9861	67.0150	60.7736	56.9400	60.1072	63.8204	70.7459	80.0909	88.2446	(72)
Total internal gains	504.9295	502.9600	486.7491	456.2868	426.2015	398.9070	382.7225	385.5503	401.0267	428.6660	462.1252	491.3321	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

West				5.4200	19.6403	0.3300	0.0000	0.7700				27.0490	(80)
West				5.4500	19.6403	0.3300	0.0000	0.7700				27.1987	(80)
Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107	(83)
Total gains	559.1772	609.0801	661.5137	711.1706	738.5712	718.6729	687.1527	647.0513	604.2852	554.5864	529.7657	535.9428	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.6811	67.8583	68.0364	68.9413	69.1252	70.0594	70.0594	70.2493	69.6827	69.1252	68.7584	68.3955	
alpha	5.5121	5.5239	5.5358	5.5961	5.6083	5.6706	5.6706	5.6833	5.6455	5.6083	5.5839	5.5597	
util living area	0.9774	0.9622	0.9228	0.8270	0.6710	0.4862	0.3522	0.3895	0.6141	0.8675	0.9599	0.9813	(86)
MIT	20.1991	20.3490	20.5810	20.8232	20.9531	20.9937	20.9992	20.9985	20.9780	20.8027	20.4622	20.1653	(87)
Th 2	20.2429	20.2447	20.2466	20.2558	20.2576	20.2668	20.2668	20.2686	20.2631	20.2576	20.2539	20.2502	(88)
util rest of house	0.9724	0.9542	0.9074	0.7971	0.6259	0.4322	0.2938	0.3281	0.5549	0.8365	0.9502	0.9772	(89)
MIT 2	19.3176	19.5059	19.7913	20.0807	20.2181	20.2628	20.2664	20.2680	20.2477	20.0661	19.6570	19.2809	(90)
Living area fraction									fLA = Living area / (4) =			0.3699	(91)
MIT	19.6437	19.8178	20.0834	20.3554	20.4900	20.5332	20.5375	20.5382	20.5179	20.3386	19.9548	19.6081	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6437	19.8178	20.0834	20.3554	20.4900	20.5332	20.5375	20.5382	20.5179	20.3386	19.9548	19.6081	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9677	0.9489	0.9037	0.8014	0.6404	0.4520	0.3154	0.3508	0.5758	0.8402	0.9456	0.9728	(94)
Useful gains	541.0978	577.9749	597.7938	569.8980	472.9807	324.8279	216.7189	226.9903	347.9544	465.9695	500.9216	521.3852	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	875.0561	848.5479	770.6238	641.3623	490.8228	326.8840	216.9339	227.3774	355.4993	543.7916	721.6302	869.5514	(97)
Space heating kWh	248.4650	181.8251	128.5855	51.4543	13.2745	0.0000	0.0000	0.0000	0.0000	57.8997	158.9102	259.0357	(98a)
Space heating requirement - total per year (kWh/year)												1099.4499	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	248.4650	181.8251	128.5855	51.4543	13.2745	0.0000	0.0000	0.0000	0.0000	57.8997	158.9102	259.0357	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1099.4499	
Space heating per m2											(98c) / (4) =	15.6550	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	248.4650	181.8251	128.5855	51.4543	13.2745	0.0000	0.0000	0.0000	0.0000	57.8997	158.9102	259.0357	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	248.4650	181.8251	128.5855	51.4543	13.2745	0.0000	0.0000	0.0000	0.0000	57.8997	158.9102	259.0357	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	63.4674	56.0352	59.2873	51.5380	49.5617	44.2260	43.3284	45.2879	46.0502	51.8700	55.7919	62.6963	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.2605	9.2676	10.2605	9.9296	10.2605	9.9296	10.2605	10.2605	9.9296	10.2605	9.9296	10.2605	(231)
Lighting	21.3301	17.1118	15.4073	11.2880	8.7192	7.1237	7.9540	10.3389	13.4291	17.6198	19.9015	21.9230	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1099.4499	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	629.1404	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	120.8097	(230a)
Total electricity for the above, kWh/year	120.8097	(231)
Electricity for lighting (calculated in Appendix L)	172.1463	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2021.5463	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1099.4499	16.4900	181.2993	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	629.1404	16.4900	103.7452	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	120.8097	16.4900	19.9215	(249)
Energy for lighting	172.1463	16.4900	28.3869	(250)
Additional standing charges			0.0000	(251)
Total energy cost			333.3530	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0415	(257)
SAP value		83.1180	
SAP rating (Section 12)		83	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1099.4499	0.1569	172.4682	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	629.1404	0.1411	88.7992	(264)
Space and water heating			261.2674	(265)
Pumps, fans and electric keep-hot	120.8097	0.1387	16.7578	(267)
Energy for lighting	172.1463	0.1443	24.8460	(268)
Total CO2, kg/year			302.8712	(272)
CO2 emissions per m2			4.3100	(273)
EI value			96.4779	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.2300	(1b)	x 2.4000	(2b) =	168.5520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		168.5520	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5200 (17)
Infiltration rate		0.1260 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1071 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1151	0.1098	0.1098	0.1017	0.1044	0.0910	0.0910	0.0884	0.0910	0.1017	0.0991	0.1071	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2511	0.2458	0.2458	0.2377	0.2404	0.2270	0.2270	0.2244	0.2270	0.2377	0.2351	0.2431	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	29.7400	10.8700	18.8700	0.2100	3.9627	110.0000	2075.7000	(29a)
Communal Wall	18.7300	2.0600	16.6700	0.2200	3.6674	110.0000	1833.6999	(29a)
Lift Shaft Wall	9.7700		9.7700	0.2100	2.0517	110.0000	1074.7001	(29a)
Terrace Roof	29.1600		29.1600	0.1300	3.7908	9.0000	262.4400	(30)
Cold Roof	41.0700		41.0700	0.0900	3.6963	9.0000	369.6300	(30)
Total net area of external elements Aum(A, m2)			128.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0875			(33)
Main dwelling								
Party Wall 1			36.8100	0.0000	0.0000	110.0000	4049.1002	(32)
Party Floor 1			70.2300			40.0000	2809.2000	(32d)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 13895.5701 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	197.8580 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	17.1600	0.0380	0.6521
E18 Party wall between dwellings	8.2500	0.0380	0.3135
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0200	0.3300	1.3266
E15 Flat roof with parapet	8.4900	0.3000	2.5470
P4 Party wall - Roof (insulation at ceiling level)	13.4000	0.1010	1.3534
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.7830 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.8705 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.9685	13.6707	13.6707	13.2239	13.3728	12.6282	12.6282	12.4792	12.6282	13.2239	13.0750	13.5217	(38)
Heat transfer coeff	55.8390	55.5412	55.5412	55.0944	55.2433	54.4987	54.4987	54.3497	54.4987	55.0944	54.9454	55.3922	(39)
Average = Sum(39)m / 12 =												55.0447	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7951	0.7908	0.7908	0.7845	0.7866	0.7760	0.7760	0.7739	0.7760	0.7845	0.7824	0.7887	(40)
HLP (average)												0.7838	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2517 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
61.9732	61.0418	59.6847	57.0881	55.1718	53.0348	51.8202	53.1670	54.6434	56.9379	59.5903	61.7357	(42a)

Hot water usage for baths

26.7737	26.3761	25.8162	24.7837	24.0106	23.1534	22.6904	23.2464	23.8518	24.7691	25.8228	26.6832	(42b)

Hot water usage for other uses

37.6896	36.3191	34.9486	33.5780	32.2075	30.8370	30.8370	32.2075	33.5780	34.9486	36.3191	37.6896	(42c)

Average daily hot water use (litres/day)	116.2239 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.4365	123.7370	120.4494	115.4498	111.3899	107.0252	105.3475	108.6209	112.0733	116.6556	121.7322	126.1086	(44)
Energy conte	200.2446	176.1999	185.1263	158.0450	149.9523	131.6000	127.4087	134.4954	138.1976	158.3005	173.4298	197.4555	(45)
Energy content (annual)										Total = Sum(45)m =		1930.4555	

Distribution loss (46)m = 0.15 x (45)m

30.0367	26.4300	27.7689	23.7068	22.4928	19.7400	19.1113	20.1743	20.7296	23.7451	26.0145	29.6183	(46)

Water storage loss (or HIU loss):	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(64)
									Total per year (kWh/year) = Sum(64)m =			2275.3805	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	66.5813	58.5865	61.5545	52.5500	49.8591	43.7570	42.3634	44.7197	45.9507	52.6349	57.6654	65.6540	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.3691	21.6444	17.6024	13.3262	9.9615	8.4099	9.0872	11.8119	15.8539	20.1301	23.4948	25.0464	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	295.2736	298.3376	290.6164	274.1788	253.4293	233.9277	220.8995	217.8355	225.5567	241.9943	262.7437	282.2453	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	(71)
Water heating gains (Table 5)													
	89.4910	87.1822	82.7345	72.9861	67.0150	60.7736	56.9400	60.1072	63.8204	70.7459	80.0909	88.2446	(72)
Total internal gains													
	504.9295	502.9600	486.7491	456.2868	426.2015	398.9070	382.7225	385.5503	401.0267	428.6660	462.1252	491.3321	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
West	5.4500	23.8018	0.3300	0.0000	0.7700	32.9618	(80)
Solar gains	65.7421	112.3310	183.3208	270.7289	322.6701	349.1703	329.2342	290.3536	227.0476	142.9844	80.7485	54.3745	(83)
Total gains	570.6715	615.2910	670.0699	727.0157	748.8716	748.0773	711.9567	675.9039	628.0743	571.6504	542.8737	545.7066	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.1252	69.4959	69.4959	70.0594	69.8706	70.8252	70.8252	71.0193	70.8252	70.0594	70.2493	69.6827	
alpha	5.6083	5.6331	5.6331	5.6706	5.6580	5.7217	5.7217	5.7346	5.7217	5.6706	5.6833	5.6455	
util living area													
	0.9683	0.9493	0.8951	0.7680	0.5840	0.3779	0.2525	0.2733	0.5146	0.8102	0.9400	0.9734	(86)
MIT	20.3359	20.4731	20.6915	20.8943	20.9799	20.9986	20.9999	20.9998	20.9925	20.8803	20.5946	20.3065	(87)
Th 2	20.2576	20.2613	20.2613	20.2668	20.2650	20.2742	20.2742	20.2760	20.2742	20.2668	20.2686	20.2631	(88)
util rest of house													
	0.9614	0.9387	0.8750	0.7320	0.5353	0.3256	0.1970	0.2152	0.4548	0.7703	0.9256	0.9674	(89)
MIT 2	19.5008	19.6731	19.9355	20.1675	20.2497	20.2735	20.2742	20.2760	20.2696	20.1580	19.8311	19.4688	(90)
Living area fraction										fLA = Living area / (4) =		0.3699	(91)
MIT	19.8097	19.9690	20.2152	20.4364	20.5198	20.5417	20.5426	20.5438	20.5370	20.4252	20.1135	19.7787	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8097	19.9690	20.2152	20.4364	20.5198	20.5417	20.5426	20.5438	20.5370	20.4252	20.1135	19.7787	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9339	0.8736	0.7407	0.5524	0.3449	0.2176	0.2367	0.4767	0.7794	0.9222	0.9627	(94)
Useful gains	545.8381	574.6423	585.4008	538.4843	413.7083	258.0320	154.8996	159.9610	299.3776	445.5540	500.6165	525.3784	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	821.3746	792.5177	711.7707	580.4952	420.9449	258.4187	154.9193	159.9925	301.7597	491.7305	665.5837	813.0863	(97)
Space heating kWh													
	204.9991	146.4123	94.0192	30.2478	5.3840	0.0000	0.0000	0.0000	0.0000	34.3553	118.7764	214.0547	(98a)
Space heating requirement - total per year (kWh/year)												848.2489	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	204.9991	146.4123	94.0192	30.2478	5.3840	0.0000	0.0000	0.0000	0.0000	34.3553	118.7764	214.0547	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												848.2489	
Space heating per m2											(98c) / (4) =	12.0782	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	204.9991	146.4123	94.0192	30.2478	5.3840	0.0000	0.0000	0.0000	0.0000	34.3553	118.7764	214.0547	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	204.9991	146.4123	94.0192	30.2478	5.3840	0.0000	0.0000	0.0000	0.0000	34.3553	118.7764	214.0547	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	63.4674	56.0352	59.2873	51.5380	49.5617	44.2260	43.3284	45.2879	46.0502	51.8700	55.7919	62.6963	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.2605	9.2676	10.2605	9.9296	10.2605	9.9296	10.2605	10.2605	9.9296	10.2605	9.9296	10.2605	(231)
Lighting	21.3301	17.1118	15.4073	11.2880	8.7192	7.1237	7.9540	10.3389	13.4291	17.6198	19.9015	21.9230	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												848.2489	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												629.1404	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												120.8097	(230a)
Total electricity for the above, kWh/year												120.8097	(231)
Electricity for lighting (calculated in Appendix L)												172.1463	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1770.3453	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	848.2489	27.6700	234.7105	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	629.1404	27.6700	174.0831	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	120.8097	27.6700	33.4280	(249)
Energy for lighting	172.1463	27.6700	47.6329	(250)
Additional standing charges			0.0000	(251)
Total energy cost			489.8545	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	848.2489	0.1577	133.7604	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	629.1404	0.1411	88.7992	(264)
Space and water heating			222.5596	(265)
Pumps, fans and electric keep-hot	120.8097	0.1387	16.7578	(267)
Energy for lighting	172.1463	0.1443	24.8460	(268)
Total CO2, kg/year			264.1634	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	848.2489	1.5838	1343.4185	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	629.1404	1.5219	957.4952	(278)

Space and water heating			2300.9138 (279)
Pumps, fans and electric keep-hot	120.8097	1.5128	182.7608 (281)
Energy for lighting	172.1463	1.5338	264.0438 (282)
Total Primary energy kWh/year			2747.7184 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 83
Current environmental impact rating: A 96

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 83
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£490	£490	£0
Space heating	£268	£268	£0
Water heating	£174	£174	£0
Lighting	£48	£48	£0
Total cost of fuels	£490	£490	£0
Total cost of uses	£490	£490	£0
Delivered energy	25 kWh/m²	25 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	39 kWh/m²	39 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.2300 (1b)	x	2.4000 (2b)	=	168.5520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.5520	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5200 (17)
Infiltration rate		0.1260 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1071 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.1366	0.1339	0.1312	0.1178	0.1151	0.1017	0.1017	0.0991	0.1071	0.1151	0.1205	0.1258 (22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2726	0.2699	0.2672	0.2538	0.2511	0.2377	0.2377	0.2351	0.2431	0.2511	0.2565	0.2618 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	29.7400	10.8700	18.8700	0.2100	3.9627	110.0000	2075.7000	(29a)
Communal Wall	18.7300	2.0600	16.6700	0.2200	3.6674	110.0000	1833.6999	(29a)
Lift Shaft Wall	9.7700		9.7700	0.2100	2.0517	110.0000	1074.7001	(29a)
Terrace Roof	29.1600		29.1600	0.1300	3.7908	9.0000	262.4400	(30)
Cold Roof	41.0700		41.0700	0.0900	3.6963	9.0000	369.6300	(30)
Total net area of external elements Aum(A, m2)			128.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0875			(33)
Main dwelling								
Party Wall 1			36.8100	0.0000	0.0000	110.0000	4049.1002	(32)
Party Floor 1			70.2300			40.0000	2809.2000	(32d)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13895.5701 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 197.8580 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.1600	0.0380	0.6521
E18 Party wall between dwellings	8.2500	0.0380	0.3135
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0200	0.3300	1.3266
E15 Flat roof with parapet	8.4900	0.3000	2.5470
P4 Party wall - Roof (insulation at ceiling level)	13.4000	0.1010	1.3534
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7830 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.8705 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.1600	15.0110	14.8621	14.1175	13.9685	13.2239	13.2239	13.0750	13.5217	13.9685	14.2664	14.5642	(38)

Heat transfer coeff

	57.0304	56.8815	56.7326	55.9879	55.8390	55.0944	55.0944	54.9454	55.3922	55.8390	56.1369	56.4347	(39)

Average = Sum(39)m / 12 = 55.9507

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8121	0.8099	0.8078	0.7972	0.7951	0.7845	0.7845	0.7824	0.7887	0.7951	0.7993	0.8036	(40)
HLP (average)												0.7967	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2517 (42)

Hot water usage for mixer showers

	61.9732	61.0418	59.6847	57.0881	55.1718	53.0348	51.8202	53.1670	54.6434	56.9379	59.5903	61.7357	(42a)

Hot water usage for baths

	26.7737	26.3761	25.8162	24.7837	24.0106	23.1534	22.6904	23.2464	23.8518	24.7691	25.8228	26.6832	(42b)

Hot water usage for other uses

	37.6896	36.3191	34.9486	33.5780	32.2075	30.8370	30.8370	32.2075	33.5780	34.9486	36.3191	37.6896	(42c)

Average daily hot water use (litres/day) 116.2239 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.4365	123.7370	120.4494	115.4498	111.3899	107.0252	105.3475	108.6209	112.0733	116.6556	121.7322	126.1086	(44)
Energy conte	200.2446	176.1999	185.1263	158.0450	149.9523	131.6000	127.4087	134.4954	138.1976	158.3005	173.4298	197.4555	(45)

Energy content (annual) Total = Sum(45)m = 1930.4555

Distribution loss (46)m = 0.15 x (45)m

	30.0367	26.4300	27.7689	23.7068	22.4928	19.7400	19.1113	20.1743	20.7296	23.7451	26.0145	29.6183	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(64)

Total per year (kWh/year) = Sum(64)m = 2275.3805 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	66.5813	58.5865	61.5545	52.5500	49.8591	43.7570	42.3634	44.7197	45.9507	52.6349	57.6654	65.6540	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.3691	21.6444	17.6024	13.3262	9.9615	8.4099	9.0872	11.8119	15.8539	20.1301	23.4948	25.0464	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	295.2736	298.3376	290.6164	274.1788	253.4293	233.9277	220.8995	217.8355	225.5567	241.9943	262.7437	282.2453	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	(71)
Water heating gains (Table 5)													
	89.4910	87.1822	82.7345	72.9861	67.0150	60.7736	56.9400	60.1072	63.8204	70.7459	80.0909	88.2446	(72)
Total internal gains													
	504.9295	502.9600	486.7491	456.2868	426.2015	398.9070	382.7225	385.5503	401.0267	428.6660	462.1252	491.3321	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
West	5.4500	19.6403	0.3300	0.0000	0.7700	27.1987	(80)

Solar gains	54.2477	106.1201	174.7646	254.8838	312.3696	319.7659	304.4302	261.5010	203.2585	125.9204	67.6405	44.6107	(83)
Total gains	559.1772	609.0801	661.5137	711.1706	738.5712	718.6729	687.1527	647.0513	604.2852	554.5864	529.7657	535.9428	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.6811	67.8583	68.0364	68.9413	69.1252	70.0594	70.0594	70.2493	69.6827	69.1252	68.7584	68.3955	
alpha	5.5121	5.5239	5.5358	5.5961	5.6083	5.6706	5.6706	5.6833	5.6455	5.6083	5.5839	5.5597	
util living area													
	0.9774	0.9622	0.9228	0.8270	0.6710	0.4862	0.3522	0.3895	0.6141	0.8675	0.9599	0.9813	(86)
MIT	20.1991	20.3490	20.5810	20.8232	20.9531	20.9937	20.9992	20.9985	20.9780	20.8027	20.4622	20.1653	(87)
Th 2	20.2429	20.2447	20.2466	20.2558	20.2576	20.2668	20.2668	20.2686	20.2631	20.2576	20.2539	20.2502	(88)
util rest of house													
	0.9724	0.9542	0.9074	0.7971	0.6259	0.4322	0.2938	0.3281	0.5549	0.8365	0.9502	0.9772	(89)
MIT 2	19.3176	19.5059	19.7913	20.0807	20.2181	20.2628	20.2664	20.2680	20.2477	20.0661	19.6570	19.2809	(90)
Living area fraction									fLA = Living area / (4) =			0.3699	(91)
MIT	19.6437	19.8178	20.0834	20.3554	20.4900	20.5332	20.5375	20.5382	20.5179	20.3386	19.9548	19.6081	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6437	19.8178	20.0834	20.3554	20.4900	20.5332	20.5375	20.5382	20.5179	20.3386	19.9548	19.6081	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9677	0.9489	0.9037	0.8014	0.6404	0.4520	0.3154	0.3508	0.5758	0.8402	0.9456	0.9728	(94)
Useful gains	541.0978	577.9749	597.7938	569.8980	472.9807	324.8279	216.7189	226.9903	347.9544	465.9695	500.9216	521.3852	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	875.0561	848.5479	770.6238	641.3623	490.8228	326.8840	216.9339	227.3774	355.4993	543.7916	721.6302	869.5514	(97)
Space heating kWh													
	248.4650	181.8251	128.5855	51.4543	13.2745	0.0000	0.0000	0.0000	0.0000	57.8997	158.9102	259.0357	(98a)
Space heating requirement - total per year (kWh/year)												1099.4499	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	248.4650	181.8251	128.5855	51.4543	13.2745	0.0000	0.0000	0.0000	0.0000	57.8997	158.9102	259.0357	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1099.4499	
Space heating per m2											(98c) / (4) =	15.6550	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	248.4650	181.8251	128.5855	51.4543	13.2745	0.0000	0.0000	0.0000	0.0000	57.8997	158.9102	259.0357	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	248.4650	181.8251	128.5855	51.4543	13.2745	0.0000	0.0000	0.0000	0.0000	57.8997	158.9102	259.0357	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating
Water heating requirement

	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505 (64)
Efficiency of water heater												361.6650 (216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)
Fuel for water heating, kWh/month												
	63.4674	56.0352	59.2873	51.5380	49.5617	44.2260	43.3284	45.2879	46.0502	51.8700	55.7919	62.6963 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	10.2605	9.2676	10.2605	9.9296	10.2605	9.9296	10.2605	10.2605	9.9296	10.2605	9.9296	10.2605 (231)
Lighting	21.3301	17.1118	15.4073	11.2880	8.7192	7.1237	7.9540	10.3389	13.4291	17.6198	19.9015	21.9230 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1099.4499 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	361.6650
Water heating fuel used	629.1404 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)	
mechanical ventilation fans (SFP = 0.5875)	120.8097 (230a)
Total electricity for the above, kWh/year	120.8097 (231)
Electricity for lighting (calculated in Appendix L)	172.1463 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2021.5463 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1099.4499	16.4900	181.2993	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	629.1404	16.4900	103.7452	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	120.8097	16.4900	19.9215	(249)
Energy for lighting	172.1463	16.4900	28.3869	(250)
Additional standing charges			0.0000	(251)
Total energy cost			333.3530	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0415 (257)
SAP value		83.1180
SAP rating (Section 12)		83 (258)
SAP band		B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1099.4499	0.1569	172.4682	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	629.1404	0.1411	88.7992	(264)
Space and water heating			261.2674	(265)
Pumps, fans and electric keep-hot	120.8097	0.1387	16.7578	(267)
Energy for lighting	172.1463	0.1443	24.8460	(268)
Total CO2, kg/year			302.8712	(272)
CO2 emissions per m2			4.3100	(273)
EI value			96.4779	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.2300	(1b)	x 2.4000	(2b) =	168.5520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.2300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	168.5520	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5200	(17)
Infiltration rate		0.1260	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1071	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1151	0.1098	0.1098	0.1017	0.1044	0.0910	0.0910	0.0884	0.0910	0.1017	0.0991	0.1071	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2511	0.2458	0.2458	0.2377	0.2404	0.2270	0.2270	0.2244	0.2270	0.2377	0.2351	0.2431	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4500	1.1450	6.2405			(27)
Brickwork	29.7400	10.8700	18.8700	0.2100	3.9627	110.0000	2075.7000	(29a)
Communal Wall	18.7300	2.0600	16.6700	0.2200	3.6674	110.0000	1833.6999	(29a)
Lift Shaft Wall	9.7700		9.7700	0.2100	2.0517	110.0000	1074.7001	(29a)
Terrace Roof	29.1600		29.1600	0.1300	3.7908	9.0000	262.4400	(30)
Cold Roof	41.0700		41.0700	0.0900	3.6963	9.0000	369.6300	(30)
Total net area of external elements Aum(A, m2)			128.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0875			(33)
Main dwelling								
Party Wall 1			36.8100	0.0000	0.0000	110.0000	4049.1002	(32)
Party Floor 1			70.2300			40.0000	2809.2000	(32d)
Internal Wall 1			157.9000			9.0000	1421.0999	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 13895.5701	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	197.8580	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.1600	0.0380	0.6521
E18 Party wall between dwellings	8.2500	0.0380	0.3135
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0200	0.3300	1.3266
E15 Flat roof with parapet	8.4900	0.3000	2.5470
P4 Party wall - Roof (insulation at ceiling level)	13.4000	0.1010	1.3534
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	8.5500	0.0540	0.4617
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.7830 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.8705 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.9685	13.6707	13.6707	13.2239	13.3728	12.6282	12.6282	12.4792	12.6282	13.2239	13.0750	13.5217	(38)
Heat transfer coeff	55.8390	55.5412	55.5412	55.0944	55.2433	54.4987	54.4987	54.3497	54.4987	55.0944	54.9454	55.3922	(39)
Average = Sum(39)m / 12 =												55.0447	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7951	0.7908	0.7908	0.7845	0.7866	0.7760	0.7760	0.7739	0.7760	0.7845	0.7824	0.7887	(40)
HLP (average)												0.7838	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2517	(42)
Hot water usage for mixer showers													
	61.9732	61.0418	59.6847	57.0881	55.1718	53.0348	51.8202	53.1670	54.6434	56.9379	59.5903	61.7357	(42a)
Hot water usage for baths													
	26.7737	26.3761	25.8162	24.7837	24.0106	23.1534	22.6904	23.2464	23.8518	24.7691	25.8228	26.6832	(42b)
Hot water usage for other uses													
	37.6896	36.3191	34.9486	33.5780	32.2075	30.8370	30.8370	32.2075	33.5780	34.9486	36.3191	37.6896	(42c)
Average daily hot water use (litres/day)												116.2239	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	126.4365	123.7370	120.4494	115.4498	111.3899	107.0252	105.3475	108.6209	112.0733	116.6556	121.7322	126.1086	(44)
Energy conte	200.2446	176.1999	185.1263	158.0450	149.9523	131.6000	127.4087	134.4954	138.1976	158.3005	173.4298	197.4555	(45)
Energy content (annual)										Total = Sum(45)m =		1930.4555	
Distribution loss (46)m = 0.15 x (45)m													
	30.0367	26.4300	27.7689	23.7068	22.4928	19.7400	19.1113	20.1743	20.7296	23.7451	26.0145	29.6183	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(64)
										Total per year (kWh/year) = Sum(64)m =		2275.3805	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	66.5813	58.5865	61.5545	52.5500	49.8591	43.7570	42.3634	44.7197	45.9507	52.6349	57.6654	65.6540	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	135.1018	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.3691	21.6444	17.6024	13.3262	9.9615	8.4099	9.0872	11.8119	15.8539	20.1301	23.4948	25.0464	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	295.2736	298.3376	290.6164	274.1788	253.4293	233.9277	220.8995	217.8355	225.5567	241.9943	262.7437	282.2453	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	50.7619	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	-90.0678	(71)
Water heating gains (Table 5)													
	89.4910	87.1822	82.7345	72.9861	67.0150	60.7736	56.9400	60.1072	63.8204	70.7459	80.0909	88.2446	(72)
Total internal gains													
	504.9295	502.9600	486.7491	456.2868	426.2015	398.9070	382.7225	385.5503	401.0267	428.6660	462.1252	491.3321	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
West	5.4500	23.8018	0.3300	0.0000	0.7700	32.9618	(80)

Solar gains	65.7421	112.3310	183.3208	270.7289	322.6701	349.1703	329.2342	290.3536	227.0476	142.9844	80.7485	54.3745	(83)
Total gains	570.6715	615.2910	670.0699	727.0157	748.8716	748.0773	711.9567	675.9039	628.0743	571.6504	542.8737	545.7066	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.1252	69.4959	69.4959	70.0594	69.8706	70.8252	70.8252	71.0193	70.8252	70.0594	70.2493	69.6827	
alpha	5.6083	5.6331	5.6331	5.6706	5.6580	5.7217	5.7217	5.7346	5.7217	5.6706	5.6833	5.6455	
util living area													
	0.9683	0.9493	0.8951	0.7680	0.5840	0.3779	0.2525	0.2733	0.5146	0.8102	0.9400	0.9734	(86)
MIT	20.3359	20.4731	20.6915	20.8943	20.9799	20.9986	20.9999	20.9998	20.9925	20.8803	20.5946	20.3065	(87)
Th 2	20.2576	20.2613	20.2613	20.2668	20.2650	20.2742	20.2742	20.2760	20.2742	20.2668	20.2686	20.2631	(88)
util rest of house													
	0.9614	0.9387	0.8750	0.7320	0.5353	0.3256	0.1970	0.2152	0.4548	0.7703	0.9256	0.9674	(89)
MIT 2	19.5008	19.6731	19.9355	20.1675	20.2497	20.2735	20.2742	20.2760	20.2696	20.1580	19.8311	19.4688	(90)
Living area fraction										fLA = Living area / (4) =		0.3699	(91)
MIT	19.8097	19.9690	20.2152	20.4364	20.5198	20.5417	20.5426	20.5438	20.5370	20.4252	20.1135	19.7787	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8097	19.9690	20.2152	20.4364	20.5198	20.5417	20.5426	20.5438	20.5370	20.4252	20.1135	19.7787	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9339	0.8736	0.7407	0.5524	0.3449	0.2176	0.2367	0.4767	0.7794	0.9222	0.9627	(94)
Useful gains	545.8381	574.6423	585.4008	538.4843	413.7083	258.0320	154.8996	159.9610	299.3776	445.5540	500.6165	525.3784	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	821.3746	792.5177	711.7707	580.4952	420.9449	258.4187	154.9193	159.9925	301.7597	491.7305	665.5837	813.0863	(97)
Space heating kWh	204.9991	146.4123	94.0192	30.2478	5.3840	0.0000	0.0000	0.0000	0.0000	34.3553	118.7764	214.0547	(98a)
Space heating requirement - total per year (kWh/year)												848.2489	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	204.9991	146.4123	94.0192	30.2478	5.3840	0.0000	0.0000	0.0000	0.0000	34.3553	118.7764	214.0547	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												848.2489	
Space heating per m2											(98c) / (4) =	12.0782	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	204.9991	146.4123	94.0192	30.2478	5.3840	0.0000	0.0000	0.0000	0.0000	34.3553	118.7764	214.0547	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	204.9991	146.4123	94.0192	30.2478	5.3840	0.0000	0.0000	0.0000	0.0000	34.3553	118.7764	214.0547	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	229.5396	202.6599	214.4213	186.3950	179.2473	159.9500	156.7037	163.7904	166.5476	187.5955	201.7798	226.7505	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	63.4674	56.0352	59.2873	51.5380	49.5617	44.2260	43.3284	45.2879	46.0502	51.8700	55.7919	62.6963	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.2605	9.2676	10.2605	9.9296	10.2605	9.9296	10.2605	10.2605	9.9296	10.2605	9.9296	10.2605	(231)
Lighting	21.3301	17.1118	15.4073	11.2880	8.7192	7.1237	7.9540	10.3389	13.4291	17.6198	19.9015	21.9230	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	848.2489	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	629.1404	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	120.8097	(230a)
Total electricity for the above, kWh/year	120.8097	(231)
Electricity for lighting (calculated in Appendix L)	172.1463	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1770.3453	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	848.2489	27.6700	234.7105	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	629.1404	27.6700	174.0831	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	120.8097	27.6700	33.4280	(249)
Energy for lighting	172.1463	27.6700	47.6329	(250)

Additional standing charges	0.0000	(251)
Total energy cost	489.8545	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	848.2489	0.1577	133.7604	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	629.1404	0.1411	88.7992	(264)
Space and water heating			222.5596	(265)
Pumps, fans and electric keep-hot	120.8097	0.1387	16.7578	(267)
Energy for lighting	172.1463	0.1443	24.8460	(268)
Total CO2, kg/year			264.1634	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	848.2489	1.5838	1343.4185	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	629.1404	1.5219	957.4952	(278)
Space and water heating			2300.9138	(279)
Pumps, fans and electric keep-hot	120.8097	1.5128	182.7608	(281)
Energy for lighting	172.1463	1.5338	264.0438	(282)
Total Primary energy kWh/year			2747.7184	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-20	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-20
Plot Address	Flat 11, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.04	**TER**	12.71
Environmental	96 A	**% DER < TER**			60.35
CO_2 Emissions (t/year)	0.36	**DFEE**	37.27	**TFEE**	38.57
Compliance Check	See BREL	**% DFEE < TFEE**			3.39
% DPER < TPER	22.73	**DPER**	51.90	**TPER**	67.17

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	218.12	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	32.43 m	89.95 m²	2.40 m

8.0 Living Area	34.30	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	65.43	45.48	0.00	None	19.95	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	24.07	22.01	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	30.75	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	189.71

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	89.95	89.95	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	89.95

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	North	2.06	
Patio Door	Patio Door	Brickwork	West	6.50	
West	Window	Brickwork	West	8.17	
North	Window	Brickwork	North	5.28	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging — Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	28.63	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	5.52	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	11.14	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	3.80	0.33	0.33	Abbey Calculated	No
E2 Other lintels (including other steel lintels)	Independently assessed	9.39	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	32.59	0.02	0.02	RCD	No
E16 Corner (normal)	Gov Approved Scheme	16.56	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	11.04	-0.10	-0.10	RCD	No
E10 Eaves (insulation at ceiling level)	Independently assessed	12.94	0.06	0.06	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	19.78	0.10	0.10	RCD	No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	11.14	0.10	0.10	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	5.52	0.03	0.03	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value: 0.06 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0

Summary for Input Data

Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.97	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	9
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

Summary for Input Data

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-20	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-20
Plot Address	Flat 11, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.04	**TER**	12.71
Environmental	96 A	**% DER < TER**			60.35
CO_2 Emissions (t/year)	0.36	**DFEE**	37.27	**TFEE**	38.57
Compliance Check	See BREL	**% DFEE < TFEE**			3.39
% DPER < TPER	22.73	**DPER**	51.90	**TPER**	67.17

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	89.9500	(1b)	x 2.4000	(2b) =	215.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	215.8800	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9700	(17)
Infiltration rate		0.1485	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000	(23c)
Effective ac	0.2969	0.2938	0.2906	0.2748	0.2717	0.2559	0.2559	0.2528	0.2622	0.2717	0.2780	0.2843	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.4500	1.1450	15.4008			(27)
Brickwork	65.4300	19.9500	45.4800	0.2100	9.5508	110.0000	5002.8000	(29a)
Communal Wall	24.0700	2.0600	22.0100	0.2200	4.8422	110.0000	2421.1000	(29a)
Cold Roof	89.9500		89.9500	0.0900	8.0955	9.0000	809.5500	(30)
Total net area of external elements Aum(A, m2)			179.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.8040			(33)
Main dwelling								
Party Wall 1			30.7500	0.0000	0.0000	110.0000	3382.5000	(32)
Party Floor 1			89.9500			70.0000	6296.5000	(32d)
Internal Wall 1			189.7100			9.0000	1707.3901	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19619.8401	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							218.1194	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	28.6300	0.0380	1.0879
E18 Party wall between dwellings	5.5200	0.0380	0.2098
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8000	0.3300	1.2540
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.5900	0.0160	0.5214
E16 Corner (normal)	16.5600	0.0540	0.8942
E17 Corner (inverted - internal area greater than external area)	11.0400	-0.0970	-1.0709
E10 Eaves (insulation at ceiling level)	12.9400	0.0630	0.8152
E12 Gable (insulation at ceiling level)	19.7800	0.0980	1.9384
P4 Party wall - Roof (insulation at ceiling level)	11.1400	0.1010	1.1251
E25 Staggered party wall between dwellings	5.5200	0.0310	0.1711
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1599 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.9639 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.1539	20.9291	20.7043	19.5802	19.3554	18.2314	18.2314	18.0066	18.6810	19.3554	19.8051	20.2547	(38)
Heat transfer coeff	79.1178	78.8930	78.6682	77.5442	77.3194	76.1953	76.1953	75.9705	76.6449	77.3194	77.7690	78.2186	(39)
Average = Sum(39)m / 12 =												77.4880	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8796	0.8771	0.8746	0.8621	0.8596	0.8471	0.8471	0.8446	0.8521	0.8596	0.8646	0.8696	(40)
HLP (average)												0.8615	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6250 (42)
Hot water usage for mixer showers

68.2330	67.2076	65.7133	62.8544	60.7446	58.3918	57.0544	58.5373	60.1629	62.6891	65.6094	67.9715	(42a)

Hot water usage for baths

29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)

Hot water usage for other uses

41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)

Average daily hot water use (litres/day) 127.9669 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.2116	136.2390	132.6190	127.1143	122.6441	117.8383	115.9913	119.5957	123.3971	128.4424	134.0319	138.8506	(44)
Energy conte	220.4771	194.0025	203.8304	174.0131	165.1025	144.8959	140.2815	148.0845	152.1610	174.2951	190.9531	217.4064	(45)
Energy content (annual)										Total = Sum(45)m =		2125.5032	

Distribution loss (46)m = 0.15 x (45)m

33.0716	29.1004	30.5746	26.1020	24.7654	21.7344	21.0422	22.2127	22.8242	26.1443	28.6430	32.6110	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
							Total per year (kWh/year) = Sum(64)m =				2470.4282	(64)
12Total per year (kWh/year)											2470	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)

Heat gains from water heating, kWh/month

73.3086	64.5058	67.7736	57.8593	54.8966	48.1779	46.6436	49.2381	50.5935	57.9531	63.4919	72.2876	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.5548	133.4714	120.5548	124.5733	120.5548	124.5733	120.5548	120.5548	124.5733	120.5548	124.5733	120.5548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.9857	241.4656	235.2163	221.9122	205.1182	189.3342	178.7895	176.3096	182.5589	195.8630	212.6570	228.4410	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)	98.5331	95.9908	91.0936	80.3602	73.7857	66.9137	62.6930	66.1802	70.2688	77.8940	88.1832	97.1608	(72)
Total internal gains	520.4492	533.3034	509.2402	489.2213	461.8343	443.1968	424.4129	425.4202	439.7766	456.6874	487.7891	508.5322	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

West				6.5000		19.6403		0.3300		0.0000		0.7700	32.4388 (80)
North				5.2800		10.6334		0.3300		0.0000		0.7700	14.2663 (74)
West				8.1700		19.6403		0.3300		0.0000		0.7700	40.7731 (80)
Solar gains	87.4782	170.4817	282.1874	418.4014	521.8119	538.8638	511.0444	432.4059	330.0154	202.3941	108.8860	72.0990 (83)	
Total gains	607.9274	703.7851	791.4276	907.6227	983.6462	982.0606	935.4573	857.8261	769.7920	659.0815	596.6751	580.6312 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.8840	69.0803	69.2777	70.2819	70.4863	71.5261	71.5261	71.7378	71.1065	70.4863	70.0788	69.6760	
alpha	5.5923	5.6054	5.6185	5.6855	5.6991	5.7684	5.7684	5.7825	5.7404	5.6991	5.6719	5.6451	
util living area	0.9929	0.9834	0.9569	0.8642	0.6934	0.4921	0.3578	0.4060	0.6599	0.9211	0.9843	0.9944	(86)
MIT	19.9938	20.1890	20.4619	20.7833	20.9479	20.9938	20.9992	20.9984	20.9706	20.7226	20.3056	19.9648	(87)
Th 2	20.1849	20.1870	20.1892	20.1999	20.2020	20.2127	20.2127	20.2149	20.2084	20.2020	20.1977	20.1934	(88)
util rest of house	0.9910	0.9791	0.9460	0.8351	0.6444	0.4334	0.2941	0.3374	0.5940	0.8964	0.9795	0.9929	(89)
MIT 2	19.0077	19.2563	19.5980	19.9862	20.1595	20.2091	20.2124	20.2142	20.1886	19.9280	19.4140	18.9773	(90)
Living area fraction										fLA = Living area / (4) =		0.3813	(91)
MIT	19.3837	19.6120	19.9274	20.2901	20.4602	20.5083	20.5124	20.5132	20.4868	20.2310	19.7540	19.3539	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3837	19.6120	19.9274	20.2901	20.4602	20.5083	20.5124	20.5132	20.4868	20.2310	19.7540	19.3539	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9886	0.9753	0.9419	0.8386	0.6607	0.4556	0.3184	0.3636	0.6178	0.8974	0.9761	0.9908	(94)
Useful gains	600.9845	686.3706	745.4268	761.1325	649.9218	447.4625	297.8310	311.9050	475.6032	591.4616	582.4160	575.3125	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1193.3879	1160.6730	1056.3107	883.2394	677.3298	450.1868	298.1084	312.4837	489.5159	744.6615	984.0877	1185.3156	(97)
Space heating kWh	440.7482	318.7312	231.2977	87.9169	20.3915	0.0000	0.0000	0.0000	0.0000	113.9807	289.2036	453.8423	(98a)
Space heating requirement - total per year (kWh/year)												1956.1120	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	440.7482	318.7312	231.2977	87.9169	20.3915	0.0000	0.0000	0.0000	0.0000	113.9807	289.2036	453.8423	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1956.1120	
Space heating per m2											(98c) / (4) =	21.7467	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	440.7482	318.7312	231.2977	87.9169	20.3915	0.0000	0.0000	0.0000	0.0000	113.9807	289.2036	453.8423	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	440.7482	318.7312	231.2977	87.9169	20.3915	0.0000	0.0000	0.0000	0.0000	113.9807	289.2036	453.8423	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.0617	60.9577	64.4589	55.9532	53.7507	47.9023	46.8877	49.0453	49.9111	56.2925	60.6371	68.2127	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.1416	11.8699	13.1416	12.7177	13.1416	12.7177	13.1416	13.1416	12.7177	13.1416	12.7177	13.1416	(231)
Lighting	24.5369	19.6844	17.7236	12.9851	10.0301	8.1947	9.1498	11.8932	15.4481	20.2687	22.8935	25.2189	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1956.1120	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	683.0709	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	154.7320	(230a)
Total electricity for the above, kWh/year	154.7320	(231)
Electricity for lighting (calculated in Appendix L)	198.0270	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2991.9419	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1956.1120	0.1568	306.6387	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	683.0709	0.1412	96.4346	(264)
Space and water heating			403.0733	(265)
Pumps, fans and electric keep-hot	154.7320	0.1387	21.4632	(267)
Energy for lighting	198.0270	0.1443	28.5814	(268)
Total CO2, kg/year			453.1179	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1956.1120	1.5803	3091.2963	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	683.0709	1.5220	1039.6604	(278)
Space and water heating			4130.9567	(279)
Pumps, fans and electric keep-hot	154.7320	1.5128	234.0786	(281)
Energy for lighting	198.0270	1.5338	303.7405	(282)
Total Primary energy kWh/year			4668.7757	(286)
Dwelling Primary energy Rate (DPER)			51.9000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	89.9500	(1b)	x 2.4000	(2b) =	215.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	215.8800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	3 * 10 = 30.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1390	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3890	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3306	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)

Adj infilt rate												
	0.4215	0.4133	0.4050	0.3637	0.3554	0.3141	0.3141	0.3058	0.3306	0.3554	0.3719	0.3885 (22b)
Effective ac	0.5888	0.5854	0.5820	0.5661	0.5632	0.5493	0.5493	0.5468	0.5547	0.5632	0.5692	0.5755 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			19.9500	1.1450	22.8435			(27)
Brickwork	65.4300	19.9500	45.4800	0.1800	8.1864			(29a)
Communal Wall	24.0700	2.0600	22.0100	0.1800	3.9618			(29a)
Cold Roof	89.9500		89.9500	0.1100	9.8945			(30)
Total net area of external elements Aum(A, m2)			179.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.9462			(33)
Main dwelling								
Party Wall 1			30.7500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	218.1194	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	28.6300	0.0700	2.0041
E18 Party wall between dwellings	5.5200	0.0600	0.3312
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8000	0.0200	0.0760
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.5900	0.0500	1.6295
E16 Corner (normal)	16.5600	0.0900	1.4904
E17 Corner (inverted - internal area greater than external area)	11.0400	-0.0900	-0.9936
E10 Eaves (insulation at ceiling level)	12.9400	0.0600	0.7764
E12 Gable (insulation at ceiling level)	19.7800	0.0600	1.1868
P4 Party wall - Roof (insulation at ceiling level)	11.1400	0.1200	1.3368
E25 Staggered party wall between dwellings	5.5200	0.0600	0.3312
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.5583	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	59.5045	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.9498	41.7040	41.4631	40.3315	40.1198	39.1342	39.1342	38.9517	39.5139	40.1198	40.5481	40.9959	(38)
Heat transfer coeff	101.4543	101.2086	100.9676	99.8360	99.6243	98.6387	98.6387	98.4562	99.0184	99.6243	100.0526	100.5004	(39)
Average = Sum(39)m / 12 =												99.8350	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1279	1.1252	1.1225	1.1099	1.1076	1.0966	1.0966	1.0946	1.1008	1.1076	1.1123	1.1173	(40)
HLP (average)												1.1099	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6250	(42)

Hot water usage for mixer showers													
	68.2330	67.2076	65.7133	62.8544	60.7446	58.3918	57.0544	58.5373	60.1629	62.6891	65.6094	67.9715	(42a)
Hot water usage for baths													
	29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)
Hot water usage for other uses													
	41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)
Average daily hot water use (litres/day)												127.9669	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.2116	136.2390	132.6190	127.1143	122.6441	117.8383	115.9913	119.5957	123.3971	128.4424	134.0319	138.8506	(44)
Energy conte	220.4771	194.0025	203.8304	174.0131	165.1025	144.8959	140.2815	148.0845	152.1610	174.2951	190.9531	217.4064	(45)
Energy content (annual)										Total = Sum(45)m =		2125.5032	
Distribution loss (46)m = 0.15 x (45)m													
	33.0716	29.1004	30.5746	26.1020	24.7654	21.7344	21.0422	22.2127	22.8242	26.1443	28.6430	32.6110	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	267.0720	236.0883	250.4253	219.1049	211.6974	189.9877	186.8764	194.6794	197.2528	220.8900	236.0449	264.0013	(62)
WWHRS	-31.1933	-27.5876	-28.8881	-23.9205	-22.2931	-19.0763	-17.8810	-19.0147	-19.7371	-23.2679	-26.3597	-30.6156	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	235.8788	208.5007	221.5372	195.1844	189.4044	170.9114	168.9954	175.6648	177.5157	197.6222	209.6853	233.3857	(64)
									Total per year (kWh/year) = Sum(64)m =			2384.2859	(64)
12Total per year (kWh/year)												2384	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	110.5846	98.1744	105.0495	93.9328	92.1725	84.2514	83.9195	86.5140	86.6670	95.2291	99.5654	109.5636	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	120.5548	133.4714	120.5548	124.5733	120.5548	124.5733	120.5548	120.5548	124.5733	120.5548	124.5733	120.5548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	238.9857	241.4656	235.2163	221.9122	205.1182	189.3342	178.7895	176.3096	182.5589	195.8630	212.6570	228.4410	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)													
	148.6352	146.0929	141.1956	130.4623	123.8878	117.0158	112.7950	116.2823	120.3708	127.9960	138.2852	147.2628	(72)
Total internal gains													
	573.5512	586.4055	562.3423	542.3233	514.9364	493.2989	474.5149	475.5223	489.8786	509.7894	540.8911	561.6342	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.2800	10.6334	0.6300	0.7000	0.7700	17.1584	(74)
West	14.6700	19.6403	0.6300	0.7000	0.7700	88.0540	(80)

Solar gains	105.2125	205.0430	339.3944	503.2227	627.5974	648.1062	614.6470	520.0663	396.9186	243.4249	130.9602	86.7155	(83)
Total gains	678.7637	791.4485	901.7367	1045.5461	1142.5337	1141.4051	1089.1620	995.5886	886.7972	753.2143	671.8513	648.3497	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.7183	53.8488	53.9773	54.5891	54.7051	55.2517	55.2517	55.3541	55.0398	54.7051	54.4709	54.2282	
alpha	4.5812	4.5899	4.5985	4.6393	4.6470	4.6834	4.6834	4.6903	4.6693	4.6470	4.6314	4.6152	
util living area													
	0.9909	0.9810	0.9557	0.8765	0.7275	0.5371	0.3952	0.4487	0.7027	0.9257	0.9819	0.9925	(86)
MIT	19.6398	19.8637	20.1973	20.6104	20.8725	20.9756	20.9953	20.9917	20.9195	20.5470	20.0237	19.6059	(87)
Th 2	19.9781	19.9803	19.9825	19.9928	19.9947	20.0036	20.0036	20.0053	20.0002	19.9947	19.9908	19.9867	(88)
util rest of house													
	0.9883	0.9758	0.9436	0.8455	0.6704	0.4598	0.3074	0.3547	0.6235	0.8993	0.9760	0.9904	(89)
MIT 2	18.4068	18.6915	19.1096	19.6096	19.8910	19.9896	20.0020	20.0021	19.9463	19.5511	18.9042	18.3699	(90)
Living area fraction										fLA = Living area / (4) =		0.3813	(91)
MIT	18.8770	19.1385	19.5244	19.9912	20.2653	20.3656	20.3808	20.3795	20.3174	19.9309	19.3311	18.8412	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8770	19.1385	19.5244	19.9912	20.2653	20.3656	20.3808	20.3795	20.3174	19.9309	19.3311	18.8412	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9845	0.9702	0.9369	0.8454	0.6866	0.4885	0.3409	0.3905	0.6500	0.8973	0.9709	0.9871	(94)
Useful gains	668.2648	767.8252	844.8648	883.9339	784.4123	557.5731	371.3051	388.7955	576.4398	675.8827	652.3339	640.0095	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1478.8979	1441.0579	1315.0387	1107.3023	853.3097	568.7101	372.9292	391.8045	615.6400	929.5822	1223.7544	1471.4456	(97)
Space heating kWh													
	603.1111	452.4124	349.8093	160.8252	51.2596	0.0000	0.0000	0.0000	0.0000	188.7524	411.4228	618.5885	(98a)
Space heating requirement - total per year (kWh/year)												2836.1813	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	603.1111	452.4124	349.8093	160.8252	51.2596	0.0000	0.0000	0.0000	0.0000	188.7524	411.4228	618.5885	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2836.1813	
Space heating per m2											(98c) / (4) =	31.5306	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	603.1111	452.4124	349.8093	160.8252	51.2596	0.0000	0.0000	0.0000	0.0000	188.7524	411.4228	618.5885	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	653.4248	490.1543	378.9917	174.2418	55.5359	0.0000	0.0000	0.0000	0.0000	204.4989	445.7451	670.1934	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	235.8788	208.5007	221.5372	195.1844	189.4044	170.9114	168.9954	175.6648	177.5157	197.6222	209.6853	233.3857	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0708	85.7491	85.0794	83.6289	81.5607	79.8000	79.8000	79.8000	79.8000	83.9569	85.5429	86.1387	(217)
Fuel for water heating, kWh/month													
	274.0519	243.1521	260.3888	233.3934	232.2252	214.1747	211.7736	220.1313	222.4508	235.3853	245.1228	270.9416	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.0489	20.0952	18.0935	13.2561	10.2394	8.3656	9.3407	12.1414	15.7704	20.6917	23.3712	25.7451	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.8238	-35.1486	-52.8402	-62.2182	-69.5337	-65.7776	-64.9550	-60.0984	-51.9737	-41.4024	-26.7339	-20.4176 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-9.1023	-19.5196	-39.5023	-60.3843	-80.8929	-81.6804	-80.7389	-67.8955	-49.1433	-28.2791	-12.2674	-7.1719 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3072.7858	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2863.1913	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	202.1591	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1111.5010	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5112.6353	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3072.7858	0.2100	645.2850	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2863.1913	0.2100	601.2702	(264)
Space and water heating			1246.5552	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	202.1591	0.1443	29.1778	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-574.9231	0.1336	-76.8380	
PV Unit electricity exported	-536.5779	0.1254	-67.2744	
Total			-144.1124	(269)
Total CO2, kg/year			1143.5499	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3072.7858	1.1300	3472.2480	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2863.1913	1.1300	3235.4062	(278)
Space and water heating			6707.6542	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	202.1591	1.5338	310.0783	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-574.9231	1.4939	-858.8728	
PV Unit electricity exported	-536.5779	0.4602	-246.9296	
Total			-1105.8024	(283)
Total Primary energy kWh/year			6042.0309	(286)
Target Primary Energy Rate (TPER)			67.1700	(287)

Full SAP Calculation Printout

Plot Reference	P-20	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-20
Plot Address	Flat 11, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.04	**TER**	12.71
Environmental	96 A	**% DER < TER**			60.35
CO_2 Emissions (t/year)	0.36	**DFEE**	37.27	**TFEE**	38.57
Compliance Check	See BREL	**% DFEE < TFEE**			3.39
% DPER < TPER	22.73	**DPER**	51.90	**TPER**	67.17

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	89.9500 (1b)	x	2.4000 (2b)	=	215.8800	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	215.8800	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1390	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9700	(17)
Infiltration rate		0.2875	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2443	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3115	0.3054	0.2993	0.2688	0.2627	0.2321	0.2321	0.2260	0.2443	0.2627	0.2749	0.2871	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5485	0.5466	0.5448	0.5361	0.5345	0.5269	0.5269	0.5255	0.5299	0.5345	0.5378	0.5412	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.4500	1.1450	15.4008			(27)
Brickwork	65.4300	19.9500	45.4800	0.2100	9.5508	110.0000	5002.8000	(29a)
Communal Wall	24.0700	2.0600	22.0100	0.2200	4.8422	110.0000	2421.1000	(29a)
Cold Roof	89.9500		89.9500	0.0900	8.0955	9.0000	809.5500	(30)
Total net area of external elements Aum(A, m2)			179.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.8040			(33)
Main dwelling								
Party Wall 1			30.7500	0.0000	0.0000	110.0000	3382.5000	(32)
Party Floor 1			89.9500			70.0000	6296.5000	(32d)
Internal Wall 1			189.7100			9.0000	1707.3901	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 19619.8401 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	218.1194 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	28.6300	0.0380	1.0879

E18 Party wall between dwellings	5.5200	0.0380	0.2098	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1400	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8000	0.3300	1.2540	
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695	
E4 Jamb	32.5900	0.0160	0.5214	
E16 Corner (normal)	16.5600	0.0540	0.8942	
E17 Corner (inverted - internal area greater than external area)	11.0400	-0.0970	-1.0709	
E10 Eaves (insulation at ceiling level)	12.9400	0.0630	0.8152	
E12 Gable (insulation at ceiling level)	19.7800	0.0980	1.9384	
P4 Party wall - Roof (insulation at ceiling level)	11.1400	0.1010	1.1251	
E25 Staggered party wall between dwellings	5.5200	0.0310	0.1711	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1599 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.9639 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.0774	38.9432	38.8116	38.1935	38.0779	37.5396	37.5396	37.4399	37.7469	38.0779	38.3118	38.5564	(38)
Heat transfer coeff	97.0414	96.9071	96.7755	96.1574	96.0418	95.5035	95.5035	95.4038	95.7108	96.0418	96.2757	96.5203	(39)
Average = Sum(39)m / 12 =												96.1569	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0788	1.0773	1.0759	1.0690	1.0677	1.0617	1.0617	1.0606	1.0640	1.0677	1.0703	1.0730	(40)
HLP (average)												1.0690	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6250 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)

Hot water usage for other uses

41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)

Average daily hot water use (litres/day) 65.0584 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790	(44)
Energy conte	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794	(45)
Energy content (annual)										Total = Sum(45)m =		1080.4805	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

95.5509	83.5549	87.4068	74.7732	70.8293	62.1320	60.5872	64.2626	66.2781	75.8426	82.8583	94.3325	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

95.5509	83.5549	87.4068	74.7732	70.8293	62.1320	60.5872	64.2626	66.2781	75.8426	82.8583	94.3325	(64)

Total per year (kWh/year) = Sum(64)m = 918.4084 (64)
12Total per year (kWh/year) 918 (64)
Electric shower(s)

54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 621.5636 (64a)
Heat gains from water heating, kWh/month

37.5485	33.0606	35.1429	31.3770	30.6290	27.8590	27.8837	28.9873	29.2532	32.2519	33.7559	37.2439	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.5548	133.4714	120.5548	124.5733	120.5548	124.5733	120.5548	120.5548	124.5733	120.5548	124.5733	120.5548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.9857	241.4656	235.2163	221.9122	205.1182	189.3342	178.7895	176.3096	182.5589	195.8630	212.6570	228.4410	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)	50.4684	49.1973	47.2351	43.5791	41.1680	38.6931	37.4781	38.9615	40.6294	43.3493	46.8832	50.0590	(72)
Total internal gains	472.3845	486.5099	465.3818	452.4402	429.2166	414.9761	399.1980	398.2014	410.1372	422.1427	446.4891	461.4304	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5000	19.6403	0.3300	0.0000	0.7700	32.4388	(80)
North	5.2800	10.6334	0.3300	0.0000	0.7700	14.2663	(74)
West	8.1700	19.6403	0.3300	0.0000	0.7700	40.7731	(80)

Solar gains	87.4782	170.4817	282.1874	418.4014	521.8119	538.8638	511.0444	432.4059	330.0154	202.3941	108.8860	72.0990	(83)
Total gains	559.8628	656.9916	747.5692	870.8416	951.0285	953.8400	910.2424	830.6073	740.1527	624.5368	555.3751	533.5295	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.1612	56.2390	56.3154	56.6774	56.7457	57.0655	57.0655	57.1251	56.9419	56.7457	56.6078	56.4643	
alpha	4.7441	4.7493	4.7544	4.7785	4.7830	4.8044	4.8044	4.8083	4.7961	4.7830	4.7739	4.7643	
util living area	0.9958	0.9904	0.9760	0.9225	0.8001	0.6115	0.4555	0.5165	0.7772	0.9575	0.9912	0.9966	(86)
MIT	19.5704	19.7766	20.0936	20.5147	20.8218	20.9622	20.9925	20.9867	20.8851	20.4598	19.9388	19.5327	(87)
Th 2	20.0182	20.0194	20.0206	20.0262	20.0273	20.0322	20.0322	20.0331	20.0303	20.0273	20.0251	20.0229	(88)
util rest of house	0.9945	0.9877	0.9688	0.9000	0.7486	0.5302	0.3584	0.4136	0.7031	0.9406	0.9881	0.9957	(89)
MIT 2	18.7158	18.9213	19.2345	19.6407	19.9090	20.0146	20.0301	20.0290	19.9667	19.5987	19.0881	18.6819	(90)
Living area fraction									fLA = Living area / (4) =			0.3813	(91)
MIT	19.0417	19.2475	19.5621	19.9740	20.2570	20.3759	20.3971	20.3942	20.3169	19.9270	19.4125	19.0064	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0417	19.2475	19.5621	19.9740	20.2570	20.3759	20.3971	20.3942	20.3169	19.9270	19.4125	19.0064	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9929	0.9848	0.9647	0.8986	0.7617	0.5600	0.3955	0.4529	0.7268	0.9384	0.9856	0.9942	(94)
Useful gains	555.8671	647.0052	721.1430	782.5352	724.4374	534.1447	359.9999	376.1409	537.9590	586.0713	547.3648	530.4604	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1430.5509	1390.3707	1264.0896	1064.8430	821.8337	551.6213	362.6339	381.0607	595.0245	895.7846	1185.3946	1429.1149	(97)
Space heating kWh	650.7647	499.5416	403.9523	203.2616	72.4629	0.0000	0.0000	0.0000	0.0000	230.4267	459.3815	668.5989	(98a)
Space heating requirement - total per year (kWh/year)												3188.3902	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	650.7647	499.5416	403.9523	203.2616	72.4629	0.0000	0.0000	0.0000	0.0000	230.4267	459.3815	668.5989	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3188.3902	
Space heating per m2										(98c) / (4) =		35.4463	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	897.7327	706.7258	725.0688	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8909	0.9400	0.9124	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	799.7727	664.3139	661.5478	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1067.5463	1018.9263	928.2105	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	192.7971	263.8316	198.3970	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.1993	65.9579	49.5993	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												163.7564	(107)
Energy for space heating												35.4463	(99)
Energy for space cooling												1.8205	(108)
Total												37.2668	(109)
Fabric Energy Efficiency (DFEE)												37.3	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	89.9500	(1b)	x 2.4000	(2b) =	215.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		215.8800	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)

Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1390 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3890 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3306 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4215	0.4133	0.4050	0.3637	0.3554	0.3141	0.3141	0.3058	0.3306	0.3554	0.3719	0.3885	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5888	0.5854	0.5820	0.5661	0.5632	0.5493	0.5493	0.5468	0.5547	0.5632	0.5692	0.5755	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			19.9500	1.1450	22.8435			(27)
Brickwork	65.4300	19.9500	45.4800	0.1800	8.1864			(29a)
Communal Wall	24.0700	2.0600	22.0100	0.1800	3.9618			(29a)
Cold Roof	89.9500		89.9500	0.1100	9.8945			(30)
Total net area of external elements Aum(A, m2)			179.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.9462			(33)
Main dwelling								
Party Wall 1			30.7500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 218.1194 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	28.6300	0.0700	2.0041
E18 Party wall between dwellings	5.5200	0.0600	0.3312
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8000	0.0200	0.0760
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.5900	0.0500	1.6295
E16 Corner (normal)	16.5600	0.0900	1.4904
E17 Corner (inverted - internal area greater than external area)	11.0400	-0.0900	-0.9936
E10 Eaves (insulation at ceiling level)	12.9400	0.0600	0.7764
E12 Gable (insulation at ceiling level)	19.7800	0.0600	1.1868
P4 Party wall - Roof (insulation at ceiling level)	11.1400	0.1200	1.3368
E25 Staggered party wall between dwellings	5.5200	0.0600	0.3312
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.5583 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.5045 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.9498	41.7040	41.4631	40.3315	40.1198	39.1342	39.1342	38.9517	39.5139	40.1198	40.5481	40.9959	(38)
Heat transfer coeff	101.4543	101.2086	100.9676	99.8360	99.6243	98.6387	98.6387	98.4562	99.0184	99.6243	100.0526	100.5004	(39)

Average = Sum(39)m / 12 = 99.8350

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1279	1.1252	1.1225	1.1099	1.1076	1.0966	1.0966	1.0946	1.1008	1.1076	1.1123	1.1173	(40)
HLP (average)												1.1099	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6250 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)

Hot water usage for other uses

41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)

Average daily hot water use (litres/day) 65.0584 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790	(44)
Energy conte	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794	(45)

Energy content (annual) Total = Sum(45)m = 1080.4805

Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

95.5509	83.5549	87.4068	74.7732	70.8293	62.1320	60.5872	64.2626	66.2781	75.8426	82.8583	94.3325	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

95.5509	83.5549	87.4068	74.7732	70.8293	62.1320	60.5872	64.2626	66.2781	75.8426	82.8583	94.3325	(64)

Total per year (kWh/year) = Sum(64)m = 918.4084 (64)
12Total per year (kWh/year) 918 (64)

Electric shower(s)

	54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												621.5636 (64a)

Heat gains from water heating, kWh/month

	37.5485	33.0606	35.1429	31.3770	30.6290	27.8590	27.8837	28.9873	29.2532	32.2519	33.7559	37.2439 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	120.5548	133.4714	120.5548	124.5733	120.5548	124.5733	120.5548	120.5548	124.5733	120.5548	124.5733	120.5548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	238.9857	241.4656	235.2163	221.9122	205.1182	189.3342	178.7895	176.3096	182.5589	195.8630	212.6570	228.4410	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)													
	50.4684	49.1973	47.2351	43.5791	41.1680	38.6931	37.4781	38.9615	40.6294	43.3493	46.8832	50.0590	(72)
Total internal gains													
	472.3845	486.5099	465.3818	452.4402	429.2166	414.9761	399.1980	398.2014	410.1372	422.1427	446.4891	461.4304	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.2800	10.6334	0.6300	0.7000	0.7700	17.1584	(74)
West	14.6700	19.6403	0.6300	0.7000	0.7700	88.0540	(80)

Solar gains	105.2125	205.0430	339.3944	503.2227	627.5974	648.1062	614.6470	520.0663	396.9186	243.4249	130.9602	86.7155	(83)
Total gains	577.5970	691.5529	804.7762	955.6630	1056.8140	1063.0824	1013.8450	918.2678	807.0558	665.5676	577.4492	548.1459	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.7183	53.8488	53.9773	54.5891	54.7051	55.2517	55.2517	55.3541	55.0398	54.7051	54.4709	54.2282	
alpha	4.5812	4.5899	4.5985	4.6393	4.6470	4.6834	4.6834	4.6903	4.6693	4.6470	4.6314	4.6152	
util living area													
	0.9952	0.9886	0.9702	0.9039	0.7649	0.5717	0.4234	0.4840	0.7489	0.9502	0.9900	0.9962	(86)
MIT	19.5097	19.7402	20.0894	20.5401	20.8420	20.9684	20.9937	20.9886	20.8945	20.4603	19.9061	19.4759	(87)
Th 2	19.9781	19.9803	19.9825	19.9928	19.9947	20.0036	20.0036	20.0053	20.0002	19.9947	19.9908	19.9867	(88)
util rest of house													
	0.9938	0.9854	0.9615	0.8775	0.7095	0.4913	0.3299	0.3838	0.6713	0.9306	0.9865	0.9951	(89)
MIT 2	18.6247	18.8550	19.1995	19.6335	19.8924	19.9893	20.0019	20.0019	19.9433	19.5715	19.0291	18.5977	(90)
Living area fraction										fLA = Living area / (4) =		0.3813	(91)
MIT	18.9622	19.1925	19.5389	19.9792	20.2545	20.3627	20.3801	20.3781	20.3060	19.9104	19.3635	18.9326	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9622	19.1925	19.5389	19.9792	20.2545	20.3627	20.3801	20.3781	20.3060	19.9104	19.3635	18.9326	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9919	0.9821	0.9568	0.8771	0.7247	0.5210	0.3656	0.4220	0.6968	0.9286	0.9836	0.9936	(94)
Useful gains	572.9388	679.1526	770.0296	838.1834	765.9201	553.9161	370.6801	387.5117	562.3181	618.0729	567.9963	544.6138	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1487.5416	1446.5274	1316.5019	1106.1033	852.2338	568.4223	372.8644	391.6731	614.5086	927.5457	1226.9934	1480.6321	(97)
Space heating kWh													
	680.4645	515.6758	406.5754	192.9024	64.2174	0.0000	0.0000	0.0000	0.0000	230.2478	474.4779	696.3976	(98a)
Space heating requirement - total per year (kWh/year)												3260.9588	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	680.4645	515.6758	406.5754	192.9024	64.2174	0.0000	0.0000	0.0000	0.0000	230.2478	474.4779	696.3976	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3260.9588	
Space heating per m2											(98c) / (4) =	36.2530	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	927.2041	729.9267	748.2673	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9106	0.9516	0.9272	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	844.3265	694.5856	693.7970	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1195.2323	1140.0203	1030.6708	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	252.6522	331.4034	250.6341	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	63.1630	82.8509	62.6585	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												208.6724	(107)

Energy for space heating	36.2530 (99)
Energy for space cooling	2.3199 (108)
Total	38.5729 (109)
Fabric Energy Efficiency (TFEE)	38.6 (109)

Full SAP Calculation Printout

Plot Reference	P-20	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-20
Plot Address	Flat 11, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.04	**TER**	12.71
Environmental	96 A	**% DER < TER**			60.35
CO_2 Emissions (t/year)	0.36	**DFEE**	37.27	**TFEE**	38.57
Compliance Check	See BREL	**% DFEE < TFEE**			3.39
% DPER < TPER	22.73	**DPER**	51.90	**TPER**	67.17

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	89.9500	(1b)	x 2.4000	(2b) =	215.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	215.8800	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9700	(17)
Infiltration rate		0.1485	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000	(23c)
Effective ac	0.2969	0.2938	0.2906	0.2748	0.2717	0.2559	0.2559	0.2528	0.2622	0.2717	0.2780	0.2843	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.4500	1.1450	15.4008			(27)
Brickwork	65.4300	19.9500	45.4800	0.2100	9.5508	110.0000	5002.8000	(29a)
Communal Wall	24.0700	2.0600	22.0100	0.2200	4.8422	110.0000	2421.1000	(29a)
Cold Roof	89.9500		89.9500	0.0900	8.0955	9.0000	809.5500	(30)
Total net area of external elements Aum(A, m2)			179.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.8040			(33)
Main dwelling								
Party Wall 1			30.7500	0.0000	0.0000	110.0000	3382.5000	(32)
Party Floor 1			89.9500			70.0000	6296.5000	(32d)
Internal Wall 1			189.7100			9.0000	1707.3901	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19619.8401	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							218.1194	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	28.6300	0.0380	1.0879
E18 Party wall between dwellings	5.5200	0.0380	0.2098
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8000	0.3300	1.2540
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.5900	0.0160	0.5214
E16 Corner (normal)	16.5600	0.0540	0.8942
E17 Corner (inverted - internal area greater than external area)	11.0400	-0.0970	-1.0709
E10 Eaves (insulation at ceiling level)	12.9400	0.0630	0.8152
E12 Gable (insulation at ceiling level)	19.7800	0.0980	1.9384
P4 Party wall - Roof (insulation at ceiling level)	11.1400	0.1010	1.1251
E25 Staggered party wall between dwellings	5.5200	0.0310	0.1711
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1599 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.9639 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.1539	20.9291	20.7043	19.5802	19.3554	18.2314	18.2314	18.0066	18.6810	19.3554	19.8051	20.2547	(38)
Heat transfer coeff	79.1178	78.8930	78.6682	77.5442	77.3194	76.1953	76.1953	75.9705	76.6449	77.3194	77.7690	78.2186	(39)
Average = Sum(39)m / 12 =												77.4880	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8796	0.8771	0.8746	0.8621	0.8596	0.8471	0.8471	0.8446	0.8521	0.8596	0.8646	0.8696	(40)
HLP (average)												0.8615	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6250 (42)
Hot water usage for mixer showers

68.2330	67.2076	65.7133	62.8544	60.7446	58.3918	57.0544	58.5373	60.1629	62.6891	65.6094	67.9715	(42a)

Hot water usage for baths

29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)

Hot water usage for other uses

41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)

Average daily hot water use (litres/day) 127.9669 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.2116	136.2390	132.6190	127.1143	122.6441	117.8383	115.9913	119.5957	123.3971	128.4424	134.0319	138.8506	(44)
Energy conte	220.4771	194.0025	203.8304	174.0131	165.1025	144.8959	140.2815	148.0845	152.1610	174.2951	190.9531	217.4064	(45)
Energy content (annual)										Total = Sum(45)m =		2125.5032	

Distribution loss (46)m = 0.15 x (45)m

33.0716	29.1004	30.5746	26.1020	24.7654	21.7344	21.0422	22.2127	22.8242	26.1443	28.6430	32.6110	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
							Total per year (kWh/year) = Sum(64)m =				2470.4282	(64)
12Total per year (kWh/year)											2470	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)

Heat gains from water heating, kWh/month

73.3086	64.5058	67.7736	57.8593	54.8966	48.1779	46.6436	49.2381	50.5935	57.9531	63.4919	72.2876	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.5548	133.4714	120.5548	124.5733	120.5548	124.5733	120.5548	120.5548	124.5733	120.5548	124.5733	120.5548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.9857	241.4656	235.2163	221.9122	205.1182	189.3342	178.7895	176.3096	182.5589	195.8630	212.6570	228.4410	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)	98.5331	95.9908	91.0936	80.3602	73.7857	66.9137	62.6930	66.1802	70.2688	77.8940	88.1832	97.1608	(72)
Total internal gains	520.4492	533.3034	509.2402	489.2213	461.8343	443.1968	424.4129	425.4202	439.7766	456.6874	487.7891	508.5322	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

West				6.5000		19.6403		0.3300		0.0000		0.7700	32.4388 (80)
North				5.2800		10.6334		0.3300		0.0000		0.7700	14.2663 (74)
West				8.1700		19.6403		0.3300		0.0000		0.7700	40.7731 (80)
Solar gains	87.4782	170.4817	282.1874	418.4014	521.8119	538.8638	511.0444	432.4059	330.0154	202.3941	108.8860	72.0990 (83)	
Total gains	607.9274	703.7851	791.4276	907.6227	983.6462	982.0606	935.4573	857.8261	769.7920	659.0815	596.6751	580.6312 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.8840	69.0803	69.2777	70.2819	70.4863	71.5261	71.5261	71.7378	71.1065	70.4863	70.0788	69.6760	
alpha	5.5923	5.6054	5.6185	5.6855	5.6991	5.7684	5.7684	5.7825	5.7404	5.6991	5.6719	5.6451	
util living area	0.9929	0.9834	0.9569	0.8642	0.6934	0.4921	0.3578	0.4060	0.6599	0.9211	0.9843	0.9944	(86)
MIT	19.9938	20.1890	20.4619	20.7833	20.9479	20.9938	20.9992	20.9984	20.9706	20.7226	20.3056	19.9648	(87)
Th 2	20.1849	20.1870	20.1892	20.1999	20.2020	20.2127	20.2127	20.2149	20.2084	20.2020	20.1977	20.1934	(88)
util rest of house	0.9910	0.9791	0.9460	0.8351	0.6444	0.4334	0.2941	0.3374	0.5940	0.8964	0.9795	0.9929	(89)
MIT 2	19.0077	19.2563	19.5980	19.9862	20.1595	20.2091	20.2124	20.2142	20.1886	19.9280	19.4140	18.9773	(90)
Living area fraction										fLA = Living area / (4) =		0.3813	(91)
MIT	19.3837	19.6120	19.9274	20.2901	20.4602	20.5083	20.5124	20.5132	20.4868	20.2310	19.7540	19.3539	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3837	19.6120	19.9274	20.2901	20.4602	20.5083	20.5124	20.5132	20.4868	20.2310	19.7540	19.3539	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9886	0.9753	0.9419	0.8386	0.6607	0.4556	0.3184	0.3636	0.6178	0.8974	0.9761	0.9908	(94)
Useful gains	600.9845	686.3706	745.4268	761.1325	649.9218	447.4625	297.8310	311.9050	475.6032	591.4616	582.4160	575.3125	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1193.3879	1160.6730	1056.3107	883.2394	677.3298	450.1868	298.1084	312.4837	489.5159	744.6615	984.0877	1185.3156	(97)
Space heating kWh	440.7482	318.7312	231.2977	87.9169	20.3915	0.0000	0.0000	0.0000	0.0000	113.9807	289.2036	453.8423	(98a)
Space heating requirement - total per year (kWh/year)												1956.1120	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	440.7482	318.7312	231.2977	87.9169	20.3915	0.0000	0.0000	0.0000	0.0000	113.9807	289.2036	453.8423	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1956.1120	
Space heating per m2											(98c) / (4) =	21.7467	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	440.7482	318.7312	231.2977	87.9169	20.3915	0.0000	0.0000	0.0000	0.0000	113.9807	289.2036	453.8423	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	440.7482	318.7312	231.2977	87.9169	20.3915	0.0000	0.0000	0.0000	0.0000	113.9807	289.2036	453.8423	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.0617	60.9577	64.4589	55.9532	53.7507	47.9023	46.8877	49.0453	49.9111	56.2925	60.6371	68.2127	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.1416	11.8699	13.1416	12.7177	13.1416	12.7177	13.1416	13.1416	12.7177	13.1416	12.7177	13.1416	(231)
Lighting	24.5369	19.6844	17.7236	12.9851	10.0301	8.1947	9.1498	11.8932	15.4481	20.2687	22.8935	25.2189	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1956.1120	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	683.0709	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	154.7320	(230a)
Total electricity for the above, kWh/year	154.7320	(231)
Electricity for lighting (calculated in Appendix L)	198.0270	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2991.9419	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1956.1120	0.1568	306.6387	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	683.0709	0.1412	96.4346	(264)
Space and water heating			403.0733	(265)
Pumps, fans and electric keep-hot	154.7320	0.1387	21.4632	(267)
Energy for lighting	198.0270	0.1443	28.5814	(268)
Total CO2, kg/year			453.1179	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1956.1120	1.5803	3091.2963	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	683.0709	1.5220	1039.6604	(278)
Space and water heating			4130.9567	(279)
Pumps, fans and electric keep-hot	154.7320	1.5128	234.0786	(281)
Energy for lighting	198.0270	1.5338	303.7405	(282)
Total Primary energy kWh/year			4668.7757	(286)
Dwelling Primary energy Rate (DPER)			51.9000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	89.9500	(1b)	x 2.4000	(2b) =	215.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	215.8800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	3 * 10 = 30.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1390	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3890	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3306	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)

Adj infilt rate												
	0.4215	0.4133	0.4050	0.3637	0.3554	0.3141	0.3141	0.3058	0.3306	0.3554	0.3719	0.3885 (22b)
Effective ac	0.5888	0.5854	0.5820	0.5661	0.5632	0.5493	0.5493	0.5468	0.5547	0.5632	0.5692	0.5755 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			19.9500	1.1450	22.8435			(27)
Brickwork	65.4300	19.9500	45.4800	0.1800	8.1864			(29a)
Communal Wall	24.0700	2.0600	22.0100	0.1800	3.9618			(29a)
Cold Roof	89.9500		89.9500	0.1100	9.8945			(30)
Total net area of external elements Aum(A, m2)			179.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.9462			(33)
Main dwelling								
Party Wall 1			30.7500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	218.1194	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	28.6300	0.0700	2.0041
E18 Party wall between dwellings	5.5200	0.0600	0.3312
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8000	0.0200	0.0760
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.5900	0.0500	1.6295
E16 Corner (normal)	16.5600	0.0900	1.4904
E17 Corner (inverted - internal area greater than external area)	11.0400	-0.0900	-0.9936
E10 Eaves (insulation at ceiling level)	12.9400	0.0600	0.7764
E12 Gable (insulation at ceiling level)	19.7800	0.0600	1.1868
P4 Party wall - Roof (insulation at ceiling level)	11.1400	0.1200	1.3368
E25 Staggered party wall between dwellings	5.5200	0.0600	0.3312
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.5583	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	59.5045	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.9498	41.7040	41.4631	40.3315	40.1198	39.1342	39.1342	38.9517	39.5139	40.1198	40.5481	40.9959	(38)
Heat transfer coeff	101.4543	101.2086	100.9676	99.8360	99.6243	98.6387	98.6387	98.4562	99.0184	99.6243	100.0526	100.5004	(39)
Average = Sum(39)m / 12 =												99.8350	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1279	1.1252	1.1225	1.1099	1.1076	1.0966	1.0966	1.0946	1.1008	1.1076	1.1123	1.1173	(40)
HLP (average)												1.1099	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.6250	(42)
Hot water usage for mixer showers												
	68.2330	67.2076	65.7133	62.8544	60.7446	58.3918	57.0544	58.5373	60.1629	62.6891	65.6094	67.9715 (42a)
Hot water usage for baths												
	29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660 (42b)
Hot water usage for other uses												
	41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130 (42c)
Average daily hot water use (litres/day)											127.9669	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.2116	136.2390	132.6190	127.1143	122.6441	117.8383	115.9913	119.5957	123.3971	128.4424	134.0319	138.8506	(44)
Energy conte	220.4771	194.0025	203.8304	174.0131	165.1025	144.8959	140.2815	148.0845	152.1610	174.2951	190.9531	217.4064	(45)
Energy content (annual)										Total = Sum(45)m =		2125.5032	
Distribution loss (46)m = 0.15 x (45)m													
	33.0716	29.1004	30.5746	26.1020	24.7654	21.7344	21.0422	22.2127	22.8242	26.1443	28.6430	32.6110	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	267.0720	236.0883	250.4253	219.1049	211.6974	189.9877	186.8764	194.6794	197.2528	220.8900	236.0449	264.0013	(62)
WWHRS	-31.1933	-27.5876	-28.8881	-23.9205	-22.2931	-19.0763	-17.8810	-19.0147	-19.7371	-23.2679	-26.3597	-30.6156	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	235.8788	208.5007	221.5372	195.1844	189.4044	170.9114	168.9954	175.6648	177.5157	197.6222	209.6853	233.3857	(64)
										Total per year (kWh/year) = Sum(64)m =		2384.2859	(64)
12Total per year (kWh/year)												2384	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	110.5846	98.1744	105.0495	93.9328	92.1725	84.2514	83.9195	86.5140	86.6670	95.2291	99.5654	109.5636	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	131.2518	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	120.5548	133.4714	120.5548	124.5733	120.5548	124.5733	120.5548	120.5548	124.5733	120.5548	124.5733	120.5548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	238.9857	241.4656	235.2163	221.9122	205.1182	189.3342	178.7895	176.3096	182.5589	195.8630	212.6570	228.4410	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	36.1252	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)													
	148.6352	146.0929	141.1956	130.4623	123.8878	117.0158	112.7950	116.2823	120.3708	127.9960	138.2852	147.2628	(72)
Total internal gains													
	573.5512	586.4055	562.3423	542.3233	514.9364	493.2989	474.5149	475.5223	489.8786	509.7894	540.8911	561.6342	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.2800	10.6334	0.6300	0.7000	0.7700	17.1584	(74)
West	14.6700	19.6403	0.6300	0.7000	0.7700	88.0540	(80)

Solar gains	105.2125	205.0430	339.3944	503.2227	627.5974	648.1062	614.6470	520.0663	396.9186	243.4249	130.9602	86.7155	(83)
Total gains	678.7637	791.4485	901.7367	1045.5461	1142.5337	1141.4051	1089.1620	995.5886	886.7972	753.2143	671.8513	648.3497	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.7183	53.8488	53.9773	54.5891	54.7051	55.2517	55.2517	55.3541	55.0398	54.7051	54.4709	54.2282	
alpha	4.5812	4.5899	4.5985	4.6393	4.6470	4.6834	4.6834	4.6903	4.6693	4.6470	4.6314	4.6152	
util living area													
	0.9909	0.9810	0.9557	0.8765	0.7275	0.5371	0.3952	0.4487	0.7027	0.9257	0.9819	0.9925	(86)
MIT	19.6398	19.8637	20.1973	20.6104	20.8725	20.9756	20.9953	20.9917	20.9195	20.5470	20.0237	19.6059	(87)
Th 2	19.9781	19.9803	19.9825	19.9928	19.9947	20.0036	20.0036	20.0053	20.0002	19.9947	19.9908	19.9867	(88)
util rest of house													
	0.9883	0.9758	0.9436	0.8455	0.6704	0.4598	0.3074	0.3547	0.6235	0.8993	0.9760	0.9904	(89)
MIT 2	18.4068	18.6915	19.1096	19.6096	19.8910	19.9896	20.0020	20.0021	19.9463	19.5511	18.9042	18.3699	(90)
Living area fraction										fLA = Living area / (4) =		0.3813	(91)
MIT	18.8770	19.1385	19.5244	19.9912	20.2653	20.3656	20.3808	20.3795	20.3174	19.9309	19.3311	18.8412	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8770	19.1385	19.5244	19.9912	20.2653	20.3656	20.3808	20.3795	20.3174	19.9309	19.3311	18.8412	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9845	0.9702	0.9369	0.8454	0.6866	0.4885	0.3409	0.3905	0.6500	0.8973	0.9709	0.9871	(94)
Useful gains	668.2648	767.8252	844.8648	883.9339	784.4123	557.5731	371.3051	388.7955	576.4398	675.8827	652.3339	640.0095	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1478.8979	1441.0579	1315.0387	1107.3023	853.3097	568.7101	372.9292	391.8045	615.6400	929.5822	1223.7544	1471.4456	(97)
Space heating kWh													
	603.1111	452.4124	349.8093	160.8252	51.2596	0.0000	0.0000	0.0000	0.0000	188.7524	411.4228	618.5885	(98a)
Space heating requirement - total per year (kWh/year)												2836.1813	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	603.1111	452.4124	349.8093	160.8252	51.2596	0.0000	0.0000	0.0000	0.0000	188.7524	411.4228	618.5885	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2836.1813	
Space heating per m2											(98c) / (4) =	31.5306	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	603.1111	452.4124	349.8093	160.8252	51.2596	0.0000	0.0000	0.0000	0.0000	188.7524	411.4228	618.5885	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	653.4248	490.1543	378.9917	174.2418	55.5359	0.0000	0.0000	0.0000	0.0000	204.4989	445.7451	670.1934	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	235.8788	208.5007	221.5372	195.1844	189.4044	170.9114	168.9954	175.6648	177.5157	197.6222	209.6853	233.3857	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0708	85.7491	85.0794	83.6289	81.5607	79.8000	79.8000	79.8000	79.8000	83.9569	85.5429	86.1387	(217)
Fuel for water heating, kWh/month													
	274.0519	243.1521	260.3888	233.3934	232.2252	214.1747	211.7736	220.1313	222.4508	235.3853	245.1228	270.9416	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.0489	20.0952	18.0935	13.2561	10.2394	8.3656	9.3407	12.1414	15.7704	20.6917	23.3712	25.7451	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.8238	-35.1486	-52.8402	-62.2182	-69.5337	-65.7776	-64.9550	-60.0984	-51.9737	-41.4024	-26.7339	-20.4176 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-9.1023	-19.5196	-39.5023	-60.3843	-80.8929	-81.6804	-80.7389	-67.8955	-49.1433	-28.2791	-12.2674	-7.1719 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3072.7858	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2863.1913	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	202.1591	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1111.5010	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5112.6353	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3072.7858	0.2100	645.2850	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2863.1913	0.2100	601.2702	(264)
Space and water heating			1246.5552	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	202.1591	0.1443	29.1778	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-574.9231	0.1336	-76.8380	
PV Unit electricity exported	-536.5779	0.1254	-67.2744	
Total			-144.1124	(269)
Total CO2, kg/year			1143.5499	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3072.7858	1.1300	3472.2480	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2863.1913	1.1300	3235.4062	(278)
Space and water heating			6707.6542	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	202.1591	1.5338	310.0783	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-574.9231	1.4939	-858.8728	
PV Unit electricity exported	-536.5779	0.4602	-246.9296	
Total			-1105.8024	(283)
Total Primary energy kWh/year			6042.0309	(286)
Target Primary Energy Rate (TPER)			67.1700	(287)

Full SAP Calculation Printout

Plot Reference	P-20	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-20
Plot Address	Flat 11, 1 Carters Close, READING, RG1 8GP	**SAP Version**	10.2

SAP Rating	80 C	**DER**	5.04	**TER**	12.71
Environmental	96 A	**% DER < TER**			60.35
CO_2 Emissions (t/year)	0.36	**DFEE**	37.27	**TFEE**	38.57
Compliance Check	See BREL	**% DFEE < TFEE**			3.39
% DPER < TPER	22.73	**DPER**	51.90	**TPER**	67.17

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	89.9500	(1b)	x 2.4000	(2b) =	215.8800	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	215.8800	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9700	(17)
Infiltration rate		0.1485	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000	(23c)
Effective ac	0.2969	0.2938	0.2906	0.2748	0.2717	0.2559	0.2559	0.2528	0.2622	0.2717	0.2780	0.2843	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.4500	1.1450	15.4008			(27)
Brickwork	65.4300	19.9500	45.4800	0.2100	9.5508	110.0000	5002.8000	(29a)
Communal Wall	24.0700	2.0600	22.0100	0.2200	4.8422	110.0000	2421.1000	(29a)
Cold Roof	89.9500		89.9500	0.0900	8.0955	9.0000	809.5500	(30)
Total net area of external elements Aum(A, m2)			179.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.8040			(33)
Main dwelling								
Party Wall 1			30.7500	0.0000	0.0000	110.0000	3382.5000	(32)
Party Floor 1			89.9500			70.0000	6296.5000	(32d)
Internal Wall 1			189.7100			9.0000	1707.3901	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19619.8401	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							218.1194	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	28.6300	0.0380	1.0879
E18 Party wall between dwellings	5.5200	0.0380	0.2098
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8000	0.3300	1.2540
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.5900	0.0160	0.5214
E16 Corner (normal)	16.5600	0.0540	0.8942
E17 Corner (inverted - internal area greater than external area)	11.0400	-0.0970	-1.0709
E10 Eaves (insulation at ceiling level)	12.9400	0.0630	0.8152
E12 Gable (insulation at ceiling level)	19.7800	0.0980	1.9384
P4 Party wall - Roof (insulation at ceiling level)	11.1400	0.1010	1.1251
E25 Staggered party wall between dwellings	5.5200	0.0310	0.1711
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1599 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.9639 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.1539	20.9291	20.7043	19.5802	19.3554	18.2314	18.2314	18.0066	18.6810	19.3554	19.8051	20.2547	(38)
Heat transfer coeff	79.1178	78.8930	78.6682	77.5442	77.3194	76.1953	76.1953	75.9705	76.6449	77.3194	77.7690	78.2186	(39)
Average = Sum(39)m / 12 =												77.4880	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8796	0.8771	0.8746	0.8621	0.8596	0.8471	0.8471	0.8446	0.8521	0.8596	0.8646	0.8696	(40)
HLP (average)												0.8615	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6250 (42)
Hot water usage for mixer showers

68.2330	67.2076	65.7133	62.8544	60.7446	58.3918	57.0544	58.5373	60.1629	62.6891	65.6094	67.9715	(42a)

Hot water usage for baths

29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)

Hot water usage for other uses

41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)

Average daily hot water use (litres/day) 127.9669 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.2116	136.2390	132.6190	127.1143	122.6441	117.8383	115.9913	119.5957	123.3971	128.4424	134.0319	138.8506	(44)
Energy conte	220.4771	194.0025	203.8304	174.0131	165.1025	144.8959	140.2815	148.0845	152.1610	174.2951	190.9531	217.4064	(45)
Energy content (annual)										Total = Sum(45)m =		2125.5032	
Distribution loss (46)m = 0.15 x (45)m	33.0716	29.1004	30.5746	26.1020	24.7654	21.7344	21.0422	22.2127	22.8242	26.1443	28.6430	32.6110	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
										Total per year (kWh/year) = Sum(64)m =		2470.4282	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

73.3086	64.5058	67.7736	57.8593	54.8966	48.1779	46.6436	49.2381	50.5935	57.9531	63.4919	72.2876	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.0328	24.8985	20.2488	15.3296	11.4591	9.6742	10.4534	13.5877	18.2373	23.1565	27.0271	28.8119	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)	98.5331	95.9908	91.0936	80.3602	73.7857	66.9137	62.6930	66.1802	70.2688	77.8940	88.1832	97.1608	(72)
Total internal gains	589.1370	587.1617	568.2875	532.7781	497.2674	465.0523	445.8724	448.7925	466.8581	499.2593	538.4848	572.8054	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5000	19.6403	0.3300	0.0000	0.7700	32.4388	(80)

North			5.2800	10.6334	0.3300	0.0000	0.7700					14.2663	(74)
West			8.1700	19.6403	0.3300	0.0000	0.7700					40.7731	(80)
Solar gains	87.4782	170.4817	282.1874	418.4014	521.8119	538.8638	511.0444	432.4059	330.0154	202.3941	108.8860	72.0990	(83)
Total gains	676.6152	757.6435	850.4748	951.1795	1019.0793	1003.9162	956.9168	881.1984	796.8736	701.6534	647.3708	644.9044	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.8840	69.0803	69.2777	70.2819	70.4863	71.5261	71.5261	71.7378	71.1065	70.4863	70.0788	69.6760	
alpha	5.5923	5.6054	5.6185	5.6855	5.6991	5.7684	5.7684	5.7825	5.7404	5.6991	5.6719	5.6451	
util living area	0.9883	0.9770	0.9429	0.8446	0.6741	0.4818	0.3498	0.3954	0.6410	0.9021	0.9774	0.9908	(86)
MIT	20.0850	20.2565	20.5245	20.8101	20.9548	20.9945	20.9993	20.9986	20.9746	20.7590	20.3694	20.0513	(87)
Th 2	20.1849	20.1870	20.1892	20.1999	20.2020	20.2127	20.2127	20.2149	20.2084	20.2020	20.1977	20.1934	(88)
util rest of house	0.9853	0.9712	0.9294	0.8134	0.6252	0.4242	0.2875	0.3285	0.5758	0.8737	0.9707	0.9884	(89)
MIT 2	19.1231	19.3406	19.6731	20.0147	20.1654	20.2095	20.2124	20.2143	20.1914	19.9681	19.4934	19.0871	(90)
Living area fraction									fLA = Living area / (4) =			0.3813	(91)
MIT	19.4899	19.6898	19.9978	20.3180	20.4664	20.5088	20.5125	20.5134	20.4901	20.2697	19.8275	19.4548	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4899	19.6898	19.9978	20.3180	20.4664	20.5088	20.5125	20.5134	20.4901	20.2697	19.8275	19.4548	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9669	0.9257	0.8183	0.6418	0.4460	0.3113	0.3541	0.5996	0.8763	0.9669	0.9855	(94)
Useful gains	664.4374	732.5839	787.2917	778.3746	654.0476	447.7798	297.8667	311.9909	477.7711	614.8930	625.9594	635.5576	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1201.7929	1166.8135	1061.8476	885.3973	677.8123	450.2229	298.1126	312.4939	489.7660	747.6561	989.8013	1193.2066	(97)
Space heating kWh	399.7926	291.8023	204.2696	77.0563	17.6809	0.0000	0.0000	0.0000	0.0000	98.7758	261.9662	414.8909	(98a)
Space heating requirement - total per year (kWh/year)												1766.2345	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	399.7926	291.8023	204.2696	77.0563	17.6809	0.0000	0.0000	0.0000	0.0000	98.7758	261.9662	414.8909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1766.2345	
Space heating per m2											(98c) / (4) =	19.6357	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	399.7926	291.8023	204.2696	77.0563	17.6809	0.0000	0.0000	0.0000	0.0000	98.7758	261.9662	414.8909	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	399.7926	291.8023	204.2696	77.0563	17.6809	0.0000	0.0000	0.0000	0.0000	98.7758	261.9662	414.8909	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.0617	60.9577	64.4589	55.9532	53.7507	47.9023	46.8877	49.0453	49.9111	56.2925	60.6371	68.2127	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.1416	11.8699	13.1416	12.7177	13.1416	12.7177	13.1416	13.1416	12.7177	13.1416	12.7177	13.1416	(231)
Lighting	24.5369	19.6844	17.7236	12.9851	10.0301	8.1947	9.1498	11.8932	15.4481	20.2687	22.8935	25.2189	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1766.2345	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	683.0709	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	154.7320	(230a)
Total electricity for the above, kWh/year	154.7320	(231)
Electricity for lighting (calculated in Appendix L)	198.0270	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2802.0644	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1766.2345	16.4900	291.2521	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	683.0709	16.4900	112.6384	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	154.7320	16.4900	25.5153	(249)
Energy for lighting	198.0270	16.4900	32.6547	(250)
Additional standing charges			0.0000	(251)
Total energy cost			462.0604	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2326	(257)
SAP value		80.0193	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1766.2345	0.1569	277.0784	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	683.0709	0.1412	96.4346	(264)
Space and water heating			373.5129	(265)
Pumps, fans and electric keep-hot	154.7320	0.1387	21.4632	(267)
Energy for lighting	198.0270	0.1443	28.5814	(268)
Total CO2, kg/year			423.5576	(272)
CO2 emissions per m2			4.7100	(273)
EI value			95.7942	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	89.9500	(1b)	x 2.4000	(2b) =	215.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		215.8800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1357	0.1294	0.1294	0.1199	0.1231	0.1073	0.1073	0.1041	0.1073	0.1199	0.1168	0.1262	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2717	0.2654	0.2654	0.2559	0.2591	0.2433	0.2433	0.2401	0.2433	0.2559	0.2528	0.2622	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.4500	1.1450	15.4008			(27)
Brickwork	65.4300	19.9500	45.4800	0.2100	9.5508	110.0000	5002.8000	(29a)
Communal Wall	24.0700	2.0600	22.0100	0.2200	4.8422	110.0000	2421.1000	(29a)
Cold Roof	89.9500		89.9500	0.0900	8.0955	9.0000	809.5500	(30)
Total net area of external elements Aum(A, m2)			179.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.8040			(33)
Main dwelling								
Party Wall 1			30.7500	0.0000	0.0000	110.0000	3382.5000	(32)
Party Floor 1			89.9500			70.0000	6296.5000	(32d)
Internal Wall 1			189.7100			9.0000	1707.3901	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 19619.8401 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	218.1194 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	28.6300	0.0380	1.0879
E18 Party wall between dwellings	5.5200	0.0380	0.2098
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8000	0.3300	1.2540
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.5900	0.0160	0.5214
E16 Corner (normal)	16.5600	0.0540	0.8942
E17 Corner (inverted - internal area greater than external area)	11.0400	-0.0970	-1.0709
E10 Eaves (insulation at ceiling level)	12.9400	0.0630	0.8152
E12 Gable (insulation at ceiling level)	19.7800	0.0980	1.9384
P4 Party wall - Roof (insulation at ceiling level)	11.1400	0.1010	1.1251
E25 Staggered party wall between dwellings	5.5200	0.0310	0.1711
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.1599 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	57.9639 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.3554	18.9058	18.9058	18.2314	18.4562	17.3322	17.3322	17.1074	17.3322	18.2314	18.0066	18.6810	(38)
Heat transfer coeff	77.3194	76.8698	76.8698	76.1953	76.4201	75.2961	75.2961	75.0713	75.2961	76.1953	75.9705	76.6449	(39)
Average = Sum(39)m / 12 =												76.1204	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8596	0.8546	0.8546	0.8471	0.8496	0.8371	0.8371	0.8346	0.8371	0.8471	0.8446	0.8521	(40)
HLP (average)												0.8463	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6250 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
68.2330	67.2076	65.7133	62.8544	60.7446	58.3918	57.0544	58.5373	60.1629	62.6891	65.6094	67.9715	(42a)

Hot water usage for baths

29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)

Hot water usage for other uses

41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)

Average daily hot water use (litres/day)	127.9669 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.2116	136.2390	132.6190	127.1143	122.6441	117.8383	115.9913	119.5957	123.3971	128.4424	134.0319	138.8506	(44)
Energy conte	220.4771	194.0025	203.8304	174.0131	165.1025	144.8959	140.2815	148.0845	152.1610	174.2951	190.9531	217.4064	(45)
Energy content (annual)										Total = Sum(45)m =		2125.5032	

Distribution loss (46)m = 0.15 x (45)m

33.0716	29.1004	30.5746	26.1020	24.7654	21.7344	21.0422	22.2127	22.8242	26.1443	28.6430	32.6110	(46)

Water storage loss (or HIU loss):	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
									Total per year (kWh/year) = Sum(64)m =			2470.4282	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	73.3086	64.5058	67.7736	57.8593	54.8966	48.1779	46.6436	49.2381	50.5935	57.9531	63.4919	72.2876	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.0328	24.8985	20.2488	15.3296	11.4591	9.6742	10.4534	13.5877	18.2373	23.1565	27.0271	28.8119	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)													
	98.5331	95.9908	91.0936	80.3602	73.7857	66.9137	62.6930	66.1802	70.2688	77.8940	88.1832	97.1608	(72)
Total internal gains													
	589.1370	587.1617	568.2875	532.7781	497.2674	465.0523	445.8724	448.7925	466.8581	499.2593	538.4848	572.8054	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5000	23.8018	0.3300	0.0000	0.7700	39.3122	(80)
North	5.2800	12.7650	0.3300	0.0000	0.7700	17.1262	(74)
West	8.1700	23.8018	0.3300	0.0000	0.7700	49.4124	(80)

Solar gains	105.8508	180.4664	296.6346	446.0436	541.2219	590.7790	554.9318	482.0090	369.6990	230.0182	129.8455	87.7058	(83)
Total gains	694.9877	767.6282	864.9221	978.8217	1038.4893	1055.8314	1000.8041	930.8016	836.5572	729.2775	668.3303	660.5112	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.4863	70.8986	70.8986	71.5261	71.3157	72.3803	72.3803	72.5971	72.3803	71.5261	71.7378	71.1065	
alpha	5.6991	5.7266	5.7266	5.7684	5.7544	5.8254	5.8254	5.8398	5.8254	5.7684	5.7825	5.7404	
util living area													
	0.9828	0.9680	0.9191	0.7836	0.5834	0.3701	0.2482	0.2741	0.5331	0.8491	0.9636	0.9862	(86)
MIT	20.2306	20.3896	20.6469	20.8887	20.9815	20.9989	20.9999	20.9999	20.9918	20.8522	20.5146	20.1999	(87)
Th 2	20.2020	20.2063	20.2063	20.2127	20.2106	20.2213	20.2213	20.2235	20.2213	20.2127	20.2149	20.2084	(88)
util rest of house													
	0.9783	0.9600	0.9005	0.7452	0.5308	0.3150	0.1897	0.2116	0.4669	0.8094	0.9530	0.9825	(89)
MIT 2	19.3206	19.5222	19.8344	20.1105	20.1972	20.2208	20.2213	20.2234	20.2166	20.0794	19.6872	19.2871	(90)
Living area fraction										fLA = Living area / (4) =		0.3813	(91)
MIT	19.6676	19.8530	20.1442	20.4073	20.4962	20.5175	20.5182	20.5195	20.5122	20.3741	20.0027	19.6352	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6676	19.8530	20.1442	20.4073	20.4962	20.5175	20.5182	20.5195	20.5122	20.3741	20.0027	19.6352	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9746	0.9558	0.8988	0.7551	0.5501	0.3360	0.2120	0.2354	0.4919	0.8182	0.9496	0.9791	(94)
Useful gains	677.3070	733.7019	777.4323	739.0973	571.3148	354.7972	212.1794	219.1344	411.4923	596.6913	634.6294	646.7271	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1126.3583	1087.9349	979.6441	800.6051	580.5056	355.2108	212.1993	219.1704	415.0472	676.1645	911.8526	1114.0470	(97)
Space heating kWh													
	334.0942	238.0446	150.4455	44.2856	6.8379	0.0000	0.0000	0.0000	0.0000	59.1281	199.6007	347.6860	(98a)
Space heating requirement - total per year (kWh/year)												1380.1227	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	334.0942	238.0446	150.4455	44.2856	6.8379	0.0000	0.0000	0.0000	0.0000	59.1281	199.6007	347.6860	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1380.1227	
Space heating per m2											(98c) / (4) =	15.3432	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	334.0942	238.0446	150.4455	44.2856	6.8379	0.0000	0.0000	0.0000	0.0000	59.1281	199.6007	347.6860	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	334.0942	238.0446	150.4455	44.2856	6.8379	0.0000	0.0000	0.0000	0.0000	59.1281	199.6007	347.6860	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	69.0617	60.9577	64.4589	55.9532	53.7507	47.9023	46.8877	49.0453	49.9111	56.2925	60.6371	68.2127	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.1416	11.8699	13.1416	12.7177	13.1416	12.7177	13.1416	13.1416	12.7177	13.1416	12.7177	13.1416	(231)
Lighting	24.5369	19.6844	17.7236	12.9851	10.0301	8.1947	9.1498	11.8932	15.4481	20.2687	22.8935	25.2189	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1380.1227	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												683.0709	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												154.7320	(230a)
Total electricity for the above, kWh/year												154.7320	(231)
Electricity for lighting (calculated in Appendix L)												198.0270	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2415.9526	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1380.1227	27.6700	381.8799	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	683.0709	27.6700	189.0057	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	154.7320	27.6700	42.8143	(249)
Energy for lighting	198.0270	27.6700	54.7941	(250)
Additional standing charges			0.0000	(251)
Total energy cost			668.4941	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1380.1227	0.1577	217.6521	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	683.0709	0.1412	96.4346	(264)
Space and water heating			314.0866	(265)
Pumps, fans and electric keep-hot	154.7320	0.1387	21.4632	(267)
Energy for lighting	198.0270	0.1443	28.5814	(268)
Total CO2, kg/year			364.1313	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1380.1227	1.5838	2185.8424	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	683.0709	1.5220	1039.6604	(278)

Space and water heating			3225.5028 (279)
Pumps, fans and electric keep-hot	154.7320	1.5128	234.0786 (281)
Energy for lighting	198.0270	1.5338	303.7405 (282)
Total Primary energy kWh/year			3763.3219 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 80
Current environmental impact rating: A 96

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 80
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£668	£668	£0
Space heating	£425	£425	£0
Water heating	£189	£189	£0
Lighting	£55	£55	£0
Total cost of fuels	£668	£668	£0
Total cost of uses	£669	£669	£0
Delivered energy	27 kWh/m²	27 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	42 kWh/m²	42 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	89.9500 (1b)	x	2.4000 (2b)	=	215.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	215.8800	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483 (22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2969	0.2938	0.2906	0.2748	0.2717	0.2559	0.2559	0.2528	0.2622	0.2717	0.2780	0.2843 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.4500	1.1450	15.4008			(27)
Brickwork	65.4300	19.9500	45.4800	0.2100	9.5508	110.0000	5002.8000	(29a)
Communal Wall	24.0700	2.0600	22.0100	0.2200	4.8422	110.0000	2421.1000	(29a)
Cold Roof	89.9500		89.9500	0.0900	8.0955	9.0000	809.5500	(30)
Total net area of external elements Aum(A, m2)			179.4500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.8040			(33)
Main dwelling								
Party Wall 1			30.7500	0.0000	0.0000	110.0000	3382.5000	(32)
Party Floor 1			89.9500			70.0000	6296.5000	(32d)
Internal Wall 1			189.7100			9.0000	1707.3901	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19619.8401 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 218.1194 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	28.6300	0.0380	1.0879
E18 Party wall between dwellings	5.5200	0.0380	0.2098
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8000	0.3300	1.2540
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.5900	0.0160	0.5214
E16 Corner (normal)	16.5600	0.0540	0.8942
E17 Corner (inverted - internal area greater than external area)	11.0400	-0.0970	-1.0709
E10 Eaves (insulation at ceiling level)	12.9400	0.0630	0.8152
E12 Gable (insulation at ceiling level)	19.7800	0.0980	1.9384
P4 Party wall - Roof (insulation at ceiling level)	11.1400	0.1010	1.1251
E25 Staggered party wall between dwellings	5.5200	0.0310	0.1711
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1599 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 57.9639 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.1539	20.9291	20.7043	19.5802	19.3554	18.2314	18.2314	18.0066	18.6810	19.3554	19.8051	20.2547	(38)
Heat transfer coeff	79.1178	78.8930	78.6682	77.5442	77.3194	76.1953	76.1953	75.9705	76.6449	77.3194	77.7690	78.2186	(39)

Average = Sum(39)m / 12 = 77.4880

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8796	0.8771	0.8746	0.8621	0.8596	0.8471	0.8471	0.8446	0.8521	0.8596	0.8646	0.8696	(40)
HLP (average)												0.8615	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6250 (42)

Hot water usage for mixer showers

68.2330	67.2076	65.7133	62.8544	60.7446	58.3918	57.0544	58.5373	60.1629	62.6891	65.6094	67.9715	(42a)

Hot water usage for baths

29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)

Hot water usage for other uses

41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)

Average daily hot water use (litres/day) 127.9669 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.2116	136.2390	132.6190	127.1143	122.6441	117.8383	115.9913	119.5957	123.3971	128.4424	134.0319	138.8506	(44)
Energy conte	220.4771	194.0025	203.8304	174.0131	165.1025	144.8959	140.2815	148.0845	152.1610	174.2951	190.9531	217.4064	(45)
Energy content (annual)										Total = Sum(45)m =		2125.5032	

Distribution loss (46)m = 0.15 x (45)m

33.0716	29.1004	30.5746	26.1020	24.7654	21.7344	21.0422	22.2127	22.8242	26.1443	28.6430	32.6110	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
									Total per year (kWh/year) = Sum(64)m =		2470.4282	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

73.3086	64.5058	67.7736	57.8593	54.8966	48.1779	46.6436	49.2381	50.5935	57.9531	63.4919	72.2876	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.0328	24.8985	20.2488	15.3296	11.4591	9.6742	10.4534	13.5877	18.2373	23.1565	27.0271	28.8119	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)													
	98.5331	95.9908	91.0936	80.3602	73.7857	66.9137	62.6930	66.1802	70.2688	77.8940	88.1832	97.1608	(72)
Total internal gains													
	589.1370	587.1617	568.2875	532.7781	497.2674	465.0523	445.8724	448.7925	466.8581	499.2593	538.4848	572.8054	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5000	19.6403	0.3300	0.0000	0.7700	32.4388	(80)
North	5.2800	10.6334	0.3300	0.0000	0.7700	14.2663	(74)
West	8.1700	19.6403	0.3300	0.0000	0.7700	40.7731	(80)

Solar gains	87.4782	170.4817	282.1874	418.4014	521.8119	538.8638	511.0444	432.4059	330.0154	202.3941	108.8860	72.0990	(83)
Total gains	676.6152	757.6435	850.4748	951.1795	1019.0793	1003.9162	956.9168	881.1984	796.8736	701.6534	647.3708	644.9044	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.8840	69.0803	69.2777	70.2819	70.4863	71.5261	71.5261	71.7378	71.1065	70.4863	70.0788	69.6760	
alpha	5.5923	5.6054	5.6185	5.6855	5.6991	5.7684	5.7684	5.7825	5.7404	5.6991	5.6719	5.6451	
util living area													
	0.9883	0.9770	0.9429	0.8446	0.6741	0.4818	0.3498	0.3954	0.6410	0.9021	0.9774	0.9908	(86)
MIT	20.0850	20.2565	20.5245	20.8101	20.9548	20.9945	20.9993	20.9986	20.9746	20.7590	20.3694	20.0513	(87)
Th 2	20.1849	20.1870	20.1892	20.1999	20.2020	20.2127	20.2127	20.2149	20.2084	20.2020	20.1977	20.1934	(88)
util rest of house													
	0.9853	0.9712	0.9294	0.8134	0.6252	0.4242	0.2875	0.3285	0.5758	0.8737	0.9707	0.9884	(89)
MIT 2	19.1231	19.3406	19.6731	20.0147	20.1654	20.2095	20.2124	20.2143	20.1914	19.9681	19.4934	19.0871	(90)
Living area fraction									fLA = Living area / (4) =			0.3813	(91)
MIT	19.4899	19.6898	19.9978	20.3180	20.4664	20.5088	20.5125	20.5134	20.4901	20.2697	19.8275	19.4548	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4899	19.6898	19.9978	20.3180	20.4664	20.5088	20.5125	20.5134	20.4901	20.2697	19.8275	19.4548	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9669	0.9257	0.8183	0.6418	0.4460	0.3113	0.3541	0.5996	0.8763	0.9669	0.9855	(94)
Useful gains	664.4374	732.5839	787.2917	778.3746	654.0476	447.7798	297.8667	311.9909	477.7711	614.8930	625.9594	635.5576	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1201.7929	1166.8135	1061.8476	885.3973	677.8123	450.2229	298.1126	312.4939	489.7660	747.6561	989.8013	1193.2066	(97)
Space heating kWh													
	399.7926	291.8023	204.2696	77.0563	17.6809	0.0000	0.0000	0.0000	0.0000	98.7758	261.9662	414.8909	(98a)
Space heating requirement - total per year (kWh/year)												1766.2345	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	399.7926	291.8023	204.2696	77.0563	17.6809	0.0000	0.0000	0.0000	0.0000	98.7758	261.9662	414.8909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1766.2345	
Space heating per m2											(98c) / (4) =	19.6357	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	399.7926	291.8023	204.2696	77.0563	17.6809	0.0000	0.0000	0.0000	0.0000	98.7758	261.9662	414.8909	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	399.7926	291.8023	204.2696	77.0563	17.6809	0.0000	0.0000	0.0000	0.0000	98.7758	261.9662	414.8909	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating
Water heating requirement

	249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014 (64)
Efficiency of water heater												361.6650 (216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)
Fuel for water heating, kWh/month												
	69.0617	60.9577	64.4589	55.9532	53.7507	47.9023	46.8877	49.0453	49.9111	56.2925	60.6371	68.2127 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	13.1416	11.8699	13.1416	12.7177	13.1416	12.7177	13.1416	13.1416	12.7177	13.1416	12.7177	13.1416 (231)
Lighting	24.5369	19.6844	17.7236	12.9851	10.0301	8.1947	9.1498	11.8932	15.4481	20.2687	22.8935	25.2189 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1766.2345 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	361.6650
Water heating fuel used	683.0709 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)

mechanical ventilation fans (SFP = 0.5875)	154.7320 (230a)
Total electricity for the above, kWh/year	154.7320 (231)
Electricity for lighting (calculated in Appendix L)	198.0270 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2802.0644 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1766.2345	16.4900	291.2521	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	683.0709	16.4900	112.6384	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	154.7320	16.4900	25.5153	(249)
Energy for lighting	198.0270	16.4900	32.6547	(250)
Additional standing charges			0.0000	(251)
Total energy cost			462.0604	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2326 (257)
SAP value		80.0193
SAP rating (Section 12)		80 (258)
SAP band		C

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1766.2345	0.1569	277.0784	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	683.0709	0.1412	96.4346	(264)
Space and water heating			373.5129	(265)
Pumps, fans and electric keep-hot	154.7320	0.1387	21.4632	(267)
Energy for lighting	198.0270	0.1443	28.5814	(268)
Total CO2, kg/year			423.5576	(272)
CO2 emissions per m2			4.7100	(273)
EI value			95.7942	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	89.9500	(1b)	x 2.4000	(2b) =	215.8800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	215.8800	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1357	0.1294	0.1294	0.1199	0.1231	0.1073	0.1073	0.1041	0.1073	0.1199	0.1168	0.1262	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2717	0.2654	0.2654	0.2559	0.2591	0.2433	0.2433	0.2401	0.2433	0.2559	0.2528	0.2622	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			13.4500	1.1450	15.4008			(27)
Brickwork	65.4300	19.9500	45.4800	0.2100	9.5508	110.0000	5002.8000	(29a)
Communal Wall	24.0700	2.0600	22.0100	0.2200	4.8422	110.0000	2421.1000	(29a)
Cold Roof	89.9500		89.9500	0.0900	8.0955	9.0000	809.5500	(30)
Total net area of external elements Aum(A, m2)			179.4500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.8040			(33)
Main dwelling								
Party Wall 1			30.7500	0.0000	0.0000	110.0000	3382.5000	(32)
Party Floor 1			89.9500			70.0000	6296.5000	(32d)
Internal Wall 1			189.7100			9.0000	1707.3901	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 19619.8401 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	218.1194 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	28.6300	0.0380	1.0879
E18 Party wall between dwellings	5.5200	0.0380	0.2098
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.1400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.8000	0.3300	1.2540
E2 Other lintels (including other steel lintels)	9.3900	0.0500	0.4695
E4 Jamb	32.5900	0.0160	0.5214
E16 Corner (normal)	16.5600	0.0540	0.8942
E17 Corner (inverted - internal area greater than external area)	11.0400	-0.0970	-1.0709
E10 Eaves (insulation at ceiling level)	12.9400	0.0630	0.8152
E12 Gable (insulation at ceiling level)	19.7800	0.0980	1.9384
P4 Party wall - Roof (insulation at ceiling level)	11.1400	0.1010	1.1251
E25 Staggered party wall between dwellings	5.5200	0.0310	0.1711
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.1599 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 57.9639 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.3554	18.9058	18.9058	18.2314	18.4562	17.3322	17.3322	17.1074	17.3322	18.2314	18.0066	18.6810	(38)
Heat transfer coeff	77.3194	76.8698	76.8698	76.1953	76.4201	75.2961	75.2961	75.0713	75.2961	76.1953	75.9705	76.6449	(39)
Average = Sum(39)m / 12 =												76.1204	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8596	0.8546	0.8546	0.8471	0.8496	0.8371	0.8371	0.8346	0.8371	0.8471	0.8446	0.8521	(40)
HLP (average)												0.8463	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6250	(42)
Hot water usage for mixer showers													
	68.2330	67.2076	65.7133	62.8544	60.7446	58.3918	57.0544	58.5373	60.1629	62.6891	65.6094	67.9715	(42a)
Hot water usage for baths													
	29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)
Hot water usage for other uses													
	41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)
Average daily hot water use (litres/day)												127.9669	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.2116	136.2390	132.6190	127.1143	122.6441	117.8383	115.9913	119.5957	123.3971	128.4424	134.0319	138.8506	(44)
Energy conte	220.4771	194.0025	203.8304	174.0131	165.1025	144.8959	140.2815	148.0845	152.1610	174.2951	190.9531	217.4064	(45)
Energy content (annual)											Total = Sum(45)m =	2125.5032	
Distribution loss (46)m = 0.15 x (45)m													
	33.0716	29.1004	30.5746	26.1020	24.7654	21.7344	21.0422	22.2127	22.8242	26.1443	28.6430	32.6110	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
										Total per year (kWh/year) = Sum(64)m =		2470.4282	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	73.3086	64.5058	67.7736	57.8593	54.8966	48.1779	46.6436	49.2381	50.5935	57.9531	63.4919	72.2876	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.0328	24.8985	20.2488	15.3296	11.4591	9.6742	10.4534	13.5877	18.2373	23.1565	27.0271	28.8119	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)													
	98.5331	95.9908	91.0936	80.3602	73.7857	66.9137	62.6930	66.1802	70.2688	77.8940	88.1832	97.1608	(72)
Total internal gains													
	589.1370	587.1617	568.2875	532.7781	497.2674	465.0523	445.8724	448.7925	466.8581	499.2593	538.4848	572.8054	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5000	23.8018	0.3300	0.0000	0.7700	39.3122	(80)
North	5.2800	12.7650	0.3300	0.0000	0.7700	17.1262	(74)
West	8.1700	23.8018	0.3300	0.0000	0.7700	49.4124	(80)

Solar gains	105.8508	180.4664	296.6346	446.0436	541.2219	590.7790	554.9318	482.0090	369.6990	230.0182	129.8455	87.7058	(83)
Total gains	694.9877	767.6282	864.9221	978.8217	1038.4893	1055.8314	1000.8041	930.8016	836.5572	729.2775	668.3303	660.5112	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.4863	70.8986	70.8986	71.5261	71.3157	72.3803	72.3803	72.5971	72.3803	71.5261	71.7378	71.1065	
alpha	5.6991	5.7266	5.7266	5.7684	5.7544	5.8254	5.8254	5.8398	5.8254	5.7684	5.7825	5.7404	
util living area													
	0.9828	0.9680	0.9191	0.7836	0.5834	0.3701	0.2482	0.2741	0.5331	0.8491	0.9636	0.9862	(86)
MIT	20.2306	20.3896	20.6469	20.8887	20.9815	20.9989	20.9999	20.9999	20.9918	20.8522	20.5146	20.1999	(87)
Th 2	20.2020	20.2063	20.2063	20.2127	20.2106	20.2213	20.2213	20.2235	20.2213	20.2127	20.2149	20.2084	(88)
util rest of house													
	0.9783	0.9600	0.9005	0.7452	0.5308	0.3150	0.1897	0.2116	0.4669	0.8094	0.9530	0.9825	(89)
MIT 2	19.3206	19.5222	19.8344	20.1105	20.1972	20.2208	20.2213	20.2234	20.2166	20.0794	19.6872	19.2871	(90)
Living area fraction										fLA = Living area / (4) =		0.3813	(91)
MIT	19.6676	19.8530	20.1442	20.4073	20.4962	20.5175	20.5182	20.5195	20.5122	20.3741	20.0027	19.6352	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6676	19.8530	20.1442	20.4073	20.4962	20.5175	20.5182	20.5195	20.5122	20.3741	20.0027	19.6352	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9746	0.9558	0.8988	0.7551	0.5501	0.3360	0.2120	0.2354	0.4919	0.8182	0.9496	0.9791	(94)
Useful gains	677.3070	733.7019	777.4323	739.0973	571.3148	354.7972	212.1794	219.1344	411.4923	596.6913	634.6294	646.7271	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1126.3583	1087.9349	979.6441	800.6051	580.5056	355.2108	212.1993	219.1704	415.0472	676.1645	911.8526	1114.0470	(97)
Space heating kWh	334.0942	238.0446	150.4455	44.2856	6.8379	0.0000	0.0000	0.0000	0.0000	59.1281	199.6007	347.6860	(98a)
Space heating requirement - total per year (kWh/year)												1380.1227	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.0942	238.0446	150.4455	44.2856	6.8379	0.0000	0.0000	0.0000	0.0000	59.1281	199.6007	347.6860	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1380.1227	
Space heating per m2											(98c) / (4) =	15.3432	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.0942	238.0446	150.4455	44.2856	6.8379	0.0000	0.0000	0.0000	0.0000	59.1281	199.6007	347.6860	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	334.0942	238.0446	150.4455	44.2856	6.8379	0.0000	0.0000	0.0000	0.0000	59.1281	199.6007	347.6860	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	249.7721	220.4625	233.1254	202.3631	194.3975	173.2459	169.5765	177.3795	180.5110	203.5901	219.3031	246.7014	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.0617	60.9577	64.4589	55.9532	53.7507	47.9023	46.8877	49.0453	49.9111	56.2925	60.6371	68.2127	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.1416	11.8699	13.1416	12.7177	13.1416	12.7177	13.1416	13.1416	12.7177	13.1416	12.7177	13.1416	(231)
Lighting	24.5369	19.6844	17.7236	12.9851	10.0301	8.1947	9.1498	11.8932	15.4481	20.2687	22.8935	25.2189	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1380.1227	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	683.0709	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	154.7320	(230a)
Total electricity for the above, kWh/year	154.7320	(231)
Electricity for lighting (calculated in Appendix L)	198.0270	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2415.9526	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1380.1227	27.6700	381.8799	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	683.0709	27.6700	189.0057	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	154.7320	27.6700	42.8143	(249)
Energy for lighting	198.0270	27.6700	54.7941	(250)

Additional standing charges	0.0000	(251)
Total energy cost	668.4941	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1380.1227	0.1577	217.6521	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	683.0709	0.1412	96.4346	(264)
Space and water heating			314.0866	(265)
Pumps, fans and electric keep-hot	154.7320	0.1387	21.4632	(267)
Energy for lighting	198.0270	0.1443	28.5814	(268)
Total CO2, kg/year			364.1313	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1380.1227	1.5838	2185.8424	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	683.0709	1.5220	1039.6604	(278)
Space and water heating			3225.5028	(279)
Pumps, fans and electric keep-hot	154.7320	1.5128	234.0786	(281)
Energy for lighting	198.0270	1.5338	303.7405	(282)
Total Primary energy kWh/year			3763.3219	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-21	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-21
Plot Address	Flat 1, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.84	**TER**	15.85
Environmental	96 A	**% DER < TER**			63.15
CO_2 Emissions (t/year)	0.24	**DFEE**	41.38	**TFEE**	40.63
Compliance Check	See BREL	**% DFEE < TFEE**			-1.84
% DPER < TPER	28.66	**DPER**	60.25	**TPER**	84.46

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	295.20	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	24.50 m	51.80 m²	2.55 m

8.0 Living Area	21.69	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	28.73	14.35	0.00	None	14.38	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	22.19	20.13	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	14.03	14.03	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	16.00	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	104.82

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	51.80

11.0 Heat Loss Floors

Summary for Input Data

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	51.80

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Window-Red	Brickwork	East	6.71	
East	Window-Red	Brickwork	East	5.42	
South	Window-Red	Brickwork	South	2.25	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	24.50	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	7.95	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.65	-0.10	-0.10	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	6.04	0.11	0.11	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	6.03	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	6.89	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	18.60	0.02	0.02	RCD	Yes
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	5.30	0.03	0.03	RCD	No

Y-value	0.05	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0

Summary for Input Data

Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.84	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

Summary for Input Data

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-21	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-21
Plot Address	Flat 1, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.84	**TER**	15.85
Environmental	96 A	**% DER < TER**			63.15
CO_2 Emissions (t/year)	0.24	**DFEE**	41.38	**TFEE**	40.63
Compliance Check	See BREL	**% DFEE < TFEE**			-1.84
% DPER < TPER	28.66	**DPER**	60.25	**TPER**	84.46

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8000 (1b)	x	2.5500 (2b)	=	132.0900	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0900	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.1420	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2899	0.2869	0.2839	0.2688	0.2658	0.2507	0.2507	0.2476	0.2567	0.2658	0.2718	0.2778	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			14.3800	1.2357	17.7700			(27)
Ground Floor			51.8000	0.1200	6.2160	110.0000	5698.0000	(28a)
Brickwork	28.7300	14.3800	14.3500	0.2100	3.0135	110.0000	1578.4999	(29a)
Communal Wall	22.1900	2.0600	20.1300	0.2200	4.4286	110.0000	2214.3001	(29a)
Stairwell Wall	14.0300		14.0300	0.1600	2.2448	110.0000	1543.3000	(29a)
Total net area of external elements Aum(A, m2)			116.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1449			(33)
Main dwelling								
Party Wall 1			16.0000	0.0000	0.0000	110.0000	1760.0000	(32)
Party Ceiling 1			51.8000			30.0000	1554.0000	(32b)
Internal Wall 1			104.8200			9.0000	943.3800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15291.4800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		295.2023 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	7.9500	0.0540	0.4293
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0970	-0.2571
P1 Party wall - Ground floor	6.0400	0.1080	0.6523
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.8900	0.0500	0.3445
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	5.3000	0.0310	0.1643

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3060 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.4508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.6363	12.5048	12.3733	11.7156	11.5841	10.9264	10.9264	10.7949	11.1895	11.5841	11.8471	12.1102	(38)
Heat transfer coeff	54.0872	53.9556	53.8241	53.1664	53.0349	52.3772	52.3772	52.2457	52.6403	53.0349	53.2980	53.5610	(39)

Average = Sum(39)m / 12 = 53.1336

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0442	1.0416	1.0391	1.0264	1.0238	1.0111	1.0111	1.0086	1.0162	1.0238	1.0289	1.0340	(40)
HLP (average)												1.0257	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7432 (42)

Hot water usage for mixer showers

53.4467	52.6435	51.4731	49.2337	47.5811	45.7381	44.6906	45.8521	47.1254	49.1042	51.3917	53.2420	(42a)

Hot water usage for baths

23.1071	22.7639	22.2806	21.3896	20.7224	19.9826	19.5830	20.0628	20.5853	21.3770	22.2864	23.0290	(42b)

Hot water usage for other uses

32.4818	31.3007	30.1195	28.9383	27.7572	26.5760	26.5760	27.7572	28.9383	30.1195	31.3007	32.4818	(42c)

Average daily hot water use (litres/day) 100.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0356	106.7081	103.8733	99.5617	96.0607	92.2967	90.8496	93.6722	96.6491	100.6007	104.9787	108.7527	(44)
Energy conte	172.6858	151.9509	159.6493	136.2949	129.3162	113.4896	109.8747	115.9857	119.1780	136.5142	149.5615	170.2805	(45)

Energy content (annual) Total = Sum(45)m = 1664.7813

Distribution loss (46)m = 0.15 x (45)m

25.9029	22.7926	23.9474	20.4442	19.3974	17.0234	16.4812	17.3979	17.8767	20.4771	22.4342	25.5421	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(64)

Total per year (kWh/year) = Sum(64)m = 2009.7063 (64)

12Total per year (kWh/year) 2010 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.4180	50.5237	53.0834	45.3181	42.9976	37.7353	36.5333	38.5653	39.6267	45.3910	49.7292	56.6183	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6197	84.8289	76.6197	79.1737	76.6197	79.1737	76.6197	76.6197	79.1737	76.6197	79.1737	76.6197	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.9071	153.4834	149.5112	141.0547	130.3798	120.3470	113.6445	112.0681	116.0404	124.4969	135.1717	145.2046	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	(71)
Water heating gains (Table 5)	77.1748	75.1840	71.3487	62.9418	57.7925	52.4101	49.1039	51.8350	55.0371	61.0094	69.0683	76.0998	(72)
Total internal gains	354.8491	362.6440	346.6271	332.3177	313.9396	301.0784	288.5157	289.6704	299.3987	311.2736	332.5613	347.0716	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.1300	19.6403	0.3100	0.0000	0.7700	56.8670	(76)
South	2.2500	46.7521	0.3100	0.0000	0.7700	25.1094	(78)

Solar gains	81.9764	152.3666	235.5860	326.3948	389.1465	394.5780	377.1398	330.4636	267.7929	176.3550	100.6697	68.4615	(83)
Total gains	436.8255	515.0106	582.2130	658.7124	703.0861	695.6564	665.6555	620.1340	567.1916	487.6286	433.2310	415.5331	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.5331	78.7246	78.9169	79.8931	80.0913	81.0969	81.0969	81.3011	80.6917	80.0913	79.6960	79.3045	
alpha	6.2355	6.2483	6.2611	6.3262	6.3394	6.4065	6.4065	6.4201	6.3794	6.3394	6.3131	6.2870	
util living area	0.9944	0.9841	0.9540	0.8531	0.6776	0.4795	0.3460	0.3870	0.6264	0.9108	0.9857	0.9958	(86)
MIT	20.1365	20.3333	20.5852	20.8497	20.9690	20.9970	20.9997	20.9994	20.9854	20.8015	20.4206	20.1034	(87)
Th 2	20.0467	20.0488	20.0509	20.0614	20.0635	20.0741	20.0741	20.0762	20.0698	20.0635	20.0593	20.0551	(88)
util rest of house	0.9924	0.9786	0.9389	0.8146	0.6179	0.4113	0.2733	0.3096	0.5483	0.8759	0.9797	0.9943	(89)
MIT 2	19.0584	19.3079	19.6187	19.9267	20.0418	20.0727	20.0740	20.0760	20.0620	19.8862	19.4285	19.0229	(90)
Living area fraction										fLA = Living area / (4) =		0.4187	(91)
MIT	19.5098	19.7373	20.0234	20.3132	20.4300	20.4597	20.4616	20.4626	20.4487	20.2694	19.8439	19.4753	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5098	19.7373	20.0234	20.3132	20.4300	20.4597	20.4616	20.4626	20.4487	20.2694	19.8439	19.4753	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9764	0.9384	0.8256	0.6418	0.4399	0.3037	0.3420	0.5808	0.8845	0.9780	0.9930	(94)
Useful gains	432.8284	502.8431	546.3373	543.8482	451.2617	306.0068	202.1916	212.1125	329.3994	431.3078	423.6978	412.6227	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	822.6552	800.5544	727.8847	606.7972	462.9973	306.9159	202.2598	212.2556	334.1959	512.8182	679.2255	818.1613	(97)
Space heating kWh	290.0311	200.0620	135.0713	45.3232	8.7313	0.0000	0.0000	0.0000	0.0000	60.6437	183.9799	301.7208	(98a)
Space heating requirement - total per year (kWh/year)												1225.5634	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	290.0311	200.0620	135.0713	45.3232	8.7313	0.0000	0.0000	0.0000	0.0000	60.6437	183.9799	301.7208	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1225.5634	
Space heating per m2											(98c) / (4) =	23.6595	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	290.0311	200.0620	135.0713	45.3232	8.7313	0.0000	0.0000	0.0000	0.0000	60.6437	183.9799	301.7208	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	290.0311	200.0620	135.0713	45.3232	8.7313	0.0000	0.0000	0.0000	0.0000	60.6437	183.9799	301.7208	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8475	49.3304	52.2429	45.5242	43.8558	39.2185	38.4803	40.1700	40.7913	45.8461	49.1923	55.1824	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0409	7.2628	8.0409	7.7815	8.0409	7.7815	8.0409	8.0409	7.7815	8.0409	7.7815	8.0409	(231)
Lighting	15.5947	12.5106	11.2644	8.2528	6.3747	5.2082	5.8152	7.5588	9.8182	12.8820	14.5502	16.0281	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1225.5634	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.6817	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.6755	(230a)
Total electricity for the above, kWh/year	94.6755	(231)
Electricity for lighting (calculated in Appendix L)	125.8579	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2001.7785	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1225.5634	0.1573	192.7937	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.6817	0.1411	78.3991	(264)
Space and water heating			271.1927	(265)
Pumps, fans and electric keep-hot	94.6755	0.1387	13.1327	(267)
Energy for lighting	125.8579	0.1443	18.1652	(268)
Total CO2, kg/year			302.4905	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1225.5634	1.5823	1939.2574	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.6817	1.5217	845.5781	(278)
Space and water heating			2784.8356	(279)
Pumps, fans and electric keep-hot	94.6755	1.5128	143.2251	(281)
Energy for lighting	125.8579	1.5338	193.0450	(282)
Total Primary energy kWh/year			3121.1056	(286)
Dwelling Primary energy Rate (DPER)			60.2500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8000	(1b)	x 2.5500	(2b) =	132.0900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0900	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1514	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4014	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3412	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4350	0.4265	0.4180	0.3753	0.3668	0.3241	0.3241	0.3156	0.3412	0.3668	0.3839	0.4009	(22b)
Effective ac	0.5946	0.5910	0.5873	0.5704	0.5673	0.5525	0.5525	0.5498	0.5582	0.5673	0.5737	0.5804	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8800	1.1450	12.4580			(27)
Ground Floor			51.8000	0.1300	6.7340			(28a)
Brickwork	28.7300	10.8800	17.8500	0.1800	3.2130			(29a)
Communal Wall	22.1900	2.0600	20.1300	0.1800	3.6234			(29a)
Stairwell Wall	14.0300		14.0300	0.1800	2.5254			(29a)
Total net area of external elements Aum(A, m2)			116.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.6138			(33)
Main dwelling								
Party Wall 1			16.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 295.2023 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0700	1.7150
E16 Corner (normal)	7.9500	0.0900	0.7155
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0900	-0.2385
P1 Party wall - Ground floor	6.0400	0.0800	0.4832
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.8900	0.0500	0.3445
E4 Jamb	18.6000	0.0500	0.9300
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	5.3000	0.0600	0.3180

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1877 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.8015 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9196	25.7594	25.6024	24.8650	24.7270	24.0848	24.0848	23.9658	24.3322	24.7270	25.0061	25.2979	(38)
Heat transfer coeff	64.7211	64.5609	64.4039	63.6665	63.5285	62.8863	62.8863	62.7673	63.1337	63.5285	63.8076	64.0994	(39)
Average = Sum(39)m / 12 =												63.6658	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2494	1.2463	1.2433	1.2291	1.2264	1.2140	1.2140	1.2117	1.2188	1.2264	1.2318	1.2374	(40)
HLP (average)												1.2291	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7432 (42)

Hot water usage for mixer showers

53.4467	52.6435	51.4731	49.2337	47.5811	45.7381	44.6906	45.8521	47.1254	49.1042	51.3917	53.2420	(42a)

Hot water usage for baths

23.1071	22.7639	22.2806	21.3896	20.7224	19.9826	19.5830	20.0628	20.5853	21.3770	22.2864	23.0290	(42b)

Hot water usage for other uses

32.4818	31.3007	30.1195	28.9383	27.7572	26.5760	26.5760	27.7572	28.9383	30.1195	31.3007	32.4818	(42c)

Average daily hot water use (litres/day) 100.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0356	106.7081	103.8733	99.5617	96.0607	92.2967	90.8496	93.6722	96.6491	100.6007	104.9787	108.7527	(44)
Energy conte	172.6858	151.9509	159.6493	136.2949	129.3162	113.4896	109.8747	115.9857	119.1780	136.5142	149.5615	170.2805	(45)
Energy content (annual)										Total = Sum(45)m =		1664.7813	
Distribution loss (46)m = 0.15 x (45)m	25.9029	22.7926	23.9474	20.4442	19.3974	17.0234	16.4812	17.3979	17.8767	20.4771	22.4342	25.5421	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	219.2807	194.0366	206.2442	181.3868	175.9111	158.5815	156.4696	162.5806	164.2699	183.1091	194.6533	216.8754	(62)
WWHRS	-24.4336	-21.6093	-22.6280	-18.7369	-17.4621	-14.9424	-14.0062	-14.8941	-15.4600	-18.2257	-20.6475	-23.9811	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.8471	172.4273	183.6162	162.6499	158.4490	143.6390	142.4634	147.6865	148.8098	164.8834	174.0058	192.8943	(64)
										Total per year (kWh/year) = Sum(64)m =		1986.3718	(64)
12Total per year (kWh/year)												1986	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	94.6939	84.1922	90.3593	81.3915	80.2735	73.8088	73.8093	75.8412	75.7002	82.6669	85.8027	93.8942	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8289	85.0605	76.8289	79.3898	76.8289	79.3898	76.8289	76.8289	79.3898	76.8289	79.3898	76.8289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.9071	153.4834	149.5112	141.0547	130.3798	120.3470	113.6445	112.0681	116.0404	124.4969	135.1717	145.2046	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	(71)

Water heating gains (Table 5)

	127.2768	125.2861	121.4507	113.0438	107.8946	102.5122	99.2060	101.9371	105.1391	111.1114	119.1704	126.2019 (72)

Total internal gains

	408.1603	415.9776	399.9383	385.6358	367.2508	351.3966	338.8269	339.9816	349.7169	364.5848	385.8795	400.3828 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.1800	19.6403	0.6300	0.7000	0.7700	55.1013	(76)
South	1.7000	46.7521	0.6300	0.7000	0.7700	24.2897	(78)

Solar gains	79.3910	147.5700	228.1874	316.1657	376.9650	382.2316	365.3370	320.1128	259.3906	170.8084	97.4964	66.3011	(83)
Total gains	487.5513	563.5476	628.1257	701.8016	744.2158	733.6281	704.1639	660.0944	609.1075	535.3932	483.3759	466.6840	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.6298	65.7927	65.9530	66.7169	66.8618	67.5447	67.5447	67.6727	67.2800	66.8618	66.5694	66.2663	
alpha	5.3753	5.3862	5.3969	5.4478	5.4575	5.5030	5.5030	5.5115	5.4853	5.4575	5.4380	5.4178	
util living area	0.9923	0.9827	0.9582	0.8814	0.7339	0.5393	0.3915	0.4348	0.6786	0.9190	0.9829	0.9939	(86)
MIT	19.9359	20.1340	20.4077	20.7286	20.9202	20.9878	20.9982	20.9969	20.9601	20.6982	20.2639	19.9052	(87)
Th 2	19.8807	19.8831	19.8855	19.8968	19.8989	19.9088	19.9088	19.9106	19.9050	19.8989	19.8946	19.8902	(88)
util rest of house	0.9895	0.9765	0.9434	0.8439	0.6666	0.4518	0.2952	0.3333	0.5863	0.8835	0.9756	0.9916	(89)
MIT 2	18.6777	18.9289	19.2685	19.6493	19.8421	19.9033	19.9084	19.9098	19.8835	19.6287	19.1038	18.6460	(90)
Living area fraction									fLA = Living area / (4) =			0.4187	(91)
MIT	19.2045	19.4335	19.7455	20.1012	20.2935	20.3574	20.3647	20.3650	20.3343	20.0766	19.5896	19.1733	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2045	19.4335	19.7455	20.1012	20.2935	20.3574	20.3647	20.3650	20.3343	20.0766	19.5896	19.1733	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9872	0.9733	0.9412	0.8516	0.6919	0.4883	0.3357	0.3759	0.6240	0.8901	0.9730	0.9896	(94)
Useful gains	481.3147	548.5212	591.1621	597.6537	514.9253	358.2585	236.3596	248.1559	380.1083	476.5756	470.3101	461.8144	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	964.6375	938.2960	853.0618	713.1428	545.9335	362.0607	236.7501	248.8743	393.5959	602.0317	796.9297	959.7768	(97)
Space heating kWh	359.5922	261.9286	194.8534	83.1521	23.0701	0.0000	0.0000	0.0000	0.0000	93.3393	235.1662	370.4841	(98a)
Space heating requirement - total per year (kWh/year)												1621.5859	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	359.5922	261.9286	194.8534	83.1521	23.0701	0.0000	0.0000	0.0000	0.0000	93.3393	235.1662	370.4841	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1621.5859	
Space heating per m2										(98c) / (4) =		31.3047	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	359.5922	261.9286	194.8534	83.1521	23.0701	0.0000	0.0000	0.0000	0.0000	93.3393	235.1662	370.4841	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	389.5906	283.7797	211.1087	90.0890	24.9947	0.0000	0.0000	0.0000	0.0000	101.1260	254.7846	401.3912	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	194.8471	172.4273	183.6162	162.6499	158.4490	143.6390	142.4634	147.6865	148.8098	164.8834	174.0058	192.8943	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4146	84.9947	84.1932	82.6332	80.8413	79.8000	79.8000	79.8000	79.8000	82.8347	84.7359	85.4985	(217)
Fuel for water heating, kWh/month	228.1192	202.8684	218.0891	196.8337	195.9999	179.9988	178.5256	185.0708	186.4785	199.0512	205.3508	225.6114	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9635	12.8065	11.5309	8.4480	6.5255	5.3314	5.9528	7.7376	10.0504	13.1867	14.8943	16.4072	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0160	-20.8404	-31.5826	-37.5150	-42.2406	-40.1064	-39.6379	-36.5384	-31.3741	-24.7183	-15.7946	-11.9963	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-4.9454	-10.6416	-21.5952	-33.0888	-44.3864	-44.8111	-44.2637	-37.1701	-26.8567	-15.4096	-6.6653	-3.8918 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1756.8644	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2401.9973	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.8347	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-640.0862	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3733.6103	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1756.8644	0.2100	368.9415	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2401.9973	0.2100	504.4194	(264)
Space and water heating			873.3610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.8347	0.1443	18.5948	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.3606	0.1335	-46.2262	
PV Unit electricity exported	-293.7256	0.1253	-36.8117	
Total			-83.0379	(269)
Total CO2, kg/year			820.8472	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1756.8644	1.1300	1985.2568	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2401.9973	1.1300	2714.2570	(278)
Space and water heating			4699.5138	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.8347	1.5338	197.6110	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.3606	1.4932	-517.1825	
PV Unit electricity exported	-293.7256	0.4600	-135.1166	
Total			-652.2992	(283)
Total Primary energy kWh/year			4374.9265	(286)
Target Primary Energy Rate (TPER)			84.4600	(287)

Full SAP Calculation Printout

Plot Reference	P-21	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-21
Plot Address	Flat 1, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.84	**TER**	15.85
Environmental	96 A	**% DER < TER**			63.15
CO_2 Emissions (t/year)	0.24	**DFEE**	41.38	**TFEE**	40.63
Compliance Check	See BREL	**% DFEE < TFEE**			-1.84
% DPER < TPER	28.66	**DPER**	60.25	**TPER**	84.46

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8000 (1b)	x	2.5500 (2b)	=	132.0900	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0900	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1514	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.2934	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2494	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3180	0.3118	0.3055	0.2743	0.2681	0.2369	0.2369	0.2307	0.2494	0.2681	0.2806	0.2930	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5506	0.5486	0.5467	0.5376	0.5359	0.5281	0.5281	0.5266	0.5311	0.5359	0.5394	0.5429	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			14.3800	1.2357	17.7700			(27)
Ground Floor			51.8000	0.1200	6.2160	110.0000	5698.0000	(28a)
Brickwork	28.7300	14.3800	14.3500	0.2100	3.0135	110.0000	1578.4999	(29a)
Communal Wall	22.1900	2.0600	20.1300	0.2200	4.4286	110.0000	2214.3001	(29a)
Stairwell Wall	14.0300		14.0300	0.1600	2.2448	110.0000	1543.3000	(29a)
Total net area of external elements Aum(A, m2)			116.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1449			(33)
Main dwelling								
Party Wall 1			16.0000	0.0000	0.0000	110.0000	1760.0000	(32)
Party Ceiling 1			51.8000			30.0000	1554.0000	(32b)
Internal Wall 1			104.8200			9.0000	943.3800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15291.4800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		295.2023 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310

E16 Corner (normal)	7.9500	0.0540	0.4293
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0970	-0.2571
P1 Party wall - Ground floor	6.0400	0.1080	0.6523
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.8900	0.0500	0.3445
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	5.3000	0.0310	0.1643

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3060 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.4508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.9986	23.9131	23.8292	23.4352	23.3615	23.0183	23.0183	22.9548	23.1505	23.3615	23.5106	23.6665	(38)
Heat transfer coeff	65.4495	65.3639	65.2800	64.8860	64.8123	64.4692	64.4692	64.4056	64.6013	64.8123	64.9614	65.1173	(39)
Average = Sum(39)m / 12 =												64.8857	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2635	1.2619	1.2602	1.2526	1.2512	1.2446	1.2446	1.2434	1.2471	1.2512	1.2541	1.2571	(40)
HLP (average)												1.2526	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7432 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.1071	22.7639	22.2806	21.3896	20.7224	19.9826	19.5830	20.0628	20.5853	21.3770	22.2864	23.0290	(42b)

Hot water usage for other uses

32.4818	31.3007	30.1195	28.9383	27.7572	26.5760	26.5760	27.7572	28.9383	30.1195	31.3007	32.4818	(42c)

Average daily hot water use (litres/day) 50.9528 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5889	54.0646	52.4001	50.3279	48.4796	46.5586	46.1590	47.8200	49.5237	51.4965	53.5870	55.5108	(44)
Energy conte	88.0392	76.9872	80.5371	68.8964	65.2628	57.2492	55.8253	59.2112	61.0677	69.8802	76.3445	86.9164	(45)
Energy content (annual)										Total = Sum(45)m =		846.2173	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.8333	65.4391	68.4565	58.5620	55.4734	48.6618	47.4515	50.3295	51.9075	59.3982	64.8929	73.8790	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	74.8333	65.4391	68.4565	58.5620	55.4734	48.6618	47.4515	50.3295	51.9075	59.3982	64.8929	73.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		719.2847	(64)
12Total per year (kWh/year)												719	(64)
Electric shower(s)	42.8019	38.1369	41.6440	39.7404	40.4861	38.6198	39.9071	40.4861	39.7404	41.6440	40.8609	42.8019	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		486.8694	(64a)
Heat gains from water heating, kWh/month	29.4088	25.8940	27.5251	24.5756	23.9899	21.8204	21.8397	22.7039	22.9120	25.2605	26.4384	29.1702	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6197	84.8289	76.6197	79.1737	76.6197	79.1737	76.6197	76.6197	79.1737	76.6197	79.1737	76.6197	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.9071	153.4834	149.5112	141.0547	130.3798	120.3470	113.6445	112.0681	116.0404	124.4969	135.1717	145.2046	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	(71)
Water heating gains (Table 5)	39.5280	38.5327	36.9961	34.1328	32.2445	30.3061	29.3544	30.5160	31.8222	33.9524	36.7201	39.2073	(72)
Total internal gains	317.2023	325.9927	312.2746	303.5086	288.3915	278.9744	268.7661	268.3514	276.1838	284.2165	300.2131	310.1791	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.1300	19.6403	0.3100	0.0000	0.7700	56.8670	(76)
South	2.2500	46.7521	0.3100	0.0000	0.7700	25.1094	(78)

Solar gains	81.9764	152.3666	235.5860	326.3948	389.1465	394.5780	377.1398	330.4636	267.7929	176.3550	100.6697	68.4615	(83)
Total gains	399.1787	478.3593	547.8605	629.9034	677.5381	673.5523	645.9059	598.8150	543.9767	460.5715	400.8827	378.6406	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	64.8994	64.9844	65.0679	65.4630	65.5375	65.8863	65.8863	65.9513	65.7515	65.5375	65.3870	65.2305	
alpha	5.3266	5.3323	5.3379	5.3642	5.3692	5.3924	5.3924	5.3968	5.3834	5.3692	5.3591	5.3487	
util living area	0.9970	0.9918	0.9765	0.9195	0.7899	0.5949	0.4362	0.4891	0.7490	0.9550	0.9928	0.9978	(86)
MIT	19.7639	19.9719	20.2677	20.6332	20.8795	20.9788	20.9966	20.9939	20.9317	20.5827	20.1006	19.7250	(87)
Th 2	19.8695	19.8708	19.8721	19.8781	19.8793	19.8845	19.8845	19.8855	19.8825	19.8793	19.8770	19.8746	(88)
util rest of house	0.9959	0.9886	0.9673	0.8898	0.7247	0.4994	0.3273	0.3737	0.6554	0.9316	0.9894	0.9969	(89)
MIT 2	18.7642	18.9714	19.2618	19.6076	19.8096	19.8768	19.8839	19.8842	19.8521	19.5722	19.1051	18.7295	(90)
Living area fraction									fLA = Living area / (4) =			0.4187	(91)
MIT	19.1828	19.3903	19.6830	20.0370	20.2576	20.3382	20.3498	20.3489	20.3042	19.9953	19.5220	19.1463	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1828	19.3903	19.6830	20.0370	20.2576	20.3382	20.3498	20.3489	20.3042	19.9953	19.5220	19.1463	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9949	0.9869	0.9654	0.8946	0.7482	0.5392	0.3731	0.4223	0.6931	0.9345	0.9880	0.9961	(94)
Useful gains	397.1368	472.0757	528.9061	563.5056	506.9651	363.2045	240.9906	252.8849	377.0438	430.4233	396.0785	377.1535	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.0735	947.1434	860.5864	722.6386	554.6392	369.9386	241.7475	254.3306	400.7989	608.9311	806.9477	973.2655	(97)
Space heating kWh	429.2409	319.2455	246.7701	114.5757	35.4695	0.0000	0.0000	0.0000	0.0000	132.8098	295.8258	443.5073	(98a)
Space heating requirement - total per year (kWh/year)												2017.4446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	429.2409	319.2455	246.7701	114.5757	35.4695	0.0000	0.0000	0.0000	0.0000	132.8098	295.8258	443.5073	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2017.4446	
Space heating per m2											(98c) / (4) =	38.9468	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	606.0101	477.0717	489.4826	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9218	0.9624	0.9445	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	558.6345	459.1319	462.3268	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	759.8931	729.0952	675.5194	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	144.9062	200.8526	158.6153	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.2265	50.2132	39.6538	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												126.0935	(107)
Energy for space heating												38.9468	(99)
Energy for space cooling												2.4342	(108)
Total												41.3810	(109)
Fabric Energy Efficiency (DFEE)												41.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8000	(1b)	x 2.5500	(2b) =	132.0900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	132.0900	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1514	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4014	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3412	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4350	0.4265	0.4180	0.3753	0.3668	0.3241	0.3241	0.3156	0.3412	0.3668	0.3839	0.4009	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5946	0.5910	0.5873	0.5704	0.5673	0.5525	0.5525	0.5498	0.5582	0.5673	0.5737	0.5804	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8800	1.1450	12.4580			(27)
Ground Floor			51.8000	0.1300	6.7340			(28a)
Brickwork	28.7300	10.8800	17.8500	0.1800	3.2130			(29a)
Communal Wall	22.1900	2.0600	20.1300	0.1800	3.6234			(29a)
Stairwell Wall	14.0300		14.0300	0.1800	2.5254			(29a)
Total net area of external elements Aum(A, m2)			116.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.6138			(33)
Main dwelling								
Party Wall 1			16.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	295.2023	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0700	1.7150
E16 Corner (normal)	7.9500	0.0900	0.7155
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0900	-0.2385
P1 Party wall - Ground floor	6.0400	0.0800	0.4832
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.8900	0.0500	0.3445
E4 Jamb	18.6000	0.0500	0.9300
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	5.3000	0.0600	0.3180

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.1877	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.8015	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9196	25.7594	25.6024	24.8650	24.7270	24.0848	24.0848	23.9658	24.3322	24.7270	25.0061	25.2979	(38)
Heat transfer coeff	64.7211	64.5609	64.4039	63.6665	63.5285	62.8863	62.8863	62.7673	63.1337	63.5285	63.8076	64.0994	(39)

Average = Sum(39)m / 12 =	63.6658	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2494	1.2463	1.2433	1.2291	1.2264	1.2140	1.2140	1.2117	1.2188	1.2264	1.2318	1.2374	(40)
HLP (average)												1.2291	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7432	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.1071	22.7639	22.2806	21.3896	20.7224	19.9826	19.5830	20.0628	20.5853	21.3770	22.2864	23.0290	(42b)

Hot water usage for other uses

32.4818	31.3007	30.1195	28.9383	27.7572	26.5760	26.5760	27.7572	28.9383	30.1195	31.3007	32.4818	(42c)

Average daily hot water use (litres/day)	50.9528	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5889	54.0646	52.4001	50.3279	48.4796	46.5586	46.1590	47.8200	49.5237	51.4965	53.5870	55.5108	(44)
Energy conte	88.0392	76.9872	80.5371	68.8964	65.2628	57.2492	55.8253	59.2112	61.0677	69.8802	76.3445	86.9164	(45)

Energy content (annual) Total = Sum(45)m =	846.2173	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.8333	65.4391	68.4565	58.5620	55.4734	48.6618	47.4515	50.3295	51.9075	59.3982	64.8929	73.8790	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

74.8333	65.4391	68.4565	58.5620	55.4734	48.6618	47.4515	50.3295	51.9075	59.3982	64.8929	73.8790	(64)

Total per year (kWh/year) = Sum(64)m =	719.2847	(64)
12Total per year (kWh/year)	719	(64)

Electric shower(s)

42.8019	38.1369	41.6440	39.7404	40.4861	38.6198	39.9071	40.4861	39.7404	41.6440	40.8609	42.8019	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	486.8694	(64a)

Heat gains from water heating, kWh/month

29.4088	25.8940	27.5251	24.5756	23.9899	21.8204	21.8397	22.7039	22.9120	25.2605	26.4384	29.1702	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.8289	85.0605	76.8289	79.3898	76.8289	79.3898	76.8289	76.8289	79.3898	76.8289	79.3898	76.8289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	151.9071	153.4834	149.5112	141.0547	130.3798	120.3470	113.6445	112.0681	116.0404	124.4969	135.1717	145.2046	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	(71)
Water heating gains (Table 5)													
	39.5280	38.5327	36.9961	34.1328	32.2445	30.3061	29.3544	30.5160	31.8222	33.9524	36.7201	39.2073	(72)
Total internal gains													
	317.4115	326.2242	312.4837	303.7248	288.6007	279.1905	268.9752	268.5605	276.4000	284.4257	300.4292	310.3883	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.1800	19.6403	0.6300	0.7000	0.7700	55.1013	(76)
South	1.7000	46.7521	0.6300	0.7000	0.7700	24.2897	(78)

Solar gains	79.3910	147.5700	228.1874	316.1657	376.9650	382.2316	365.3370	320.1128	259.3906	170.8084	97.4964	66.3011	(83)
Total gains	396.8025	473.7943	540.6711	619.8905	665.5657	661.4221	634.3123	588.6733	535.7905	455.2341	397.9256	376.6894	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.6298	65.7927	65.9530	66.7169	66.8618	67.5447	67.5447	67.6727	67.2800	66.8618	66.5694	66.2663	
alpha	5.3753	5.3862	5.3969	5.4478	5.4575	5.5030	5.5030	5.5115	5.4853	5.4575	5.4380	5.4178	
util living area													
	0.9971	0.9920	0.9773	0.9207	0.7907	0.5924	0.4336	0.4855	0.7469	0.9552	0.9929	0.9978	(86)
MIT	19.7787	19.9846	20.2766	20.6430	20.8846	20.9809	20.9971	20.9947	20.9366	20.5960	20.1209	19.7482	(87)
Th 2	19.8807	19.8831	19.8855	19.8968	19.8989	19.9088	19.9088	19.9106	19.9050	19.8989	19.8946	19.8902	(88)
util rest of house													
	0.9960	0.9890	0.9683	0.8914	0.7264	0.4989	0.3276	0.3733	0.6546	0.9320	0.9896	0.9969	(89)
MIT 2	18.7877	18.9937	19.2815	19.6330	19.8320	19.9018	19.9083	19.9095	19.8768	19.6012	19.1393	18.7648	(90)
Living area fraction									fLA = Living area / (4) =			0.4187	(91)
MIT	19.2027	19.4086	19.6982	20.0559	20.2727	20.3537	20.3642	20.3639	20.3205	20.0177	19.5503	19.1766	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2027	19.4086	19.6982	20.0559	20.2727	20.3537	20.3642	20.3639	20.3205	20.0177	19.5503	19.1766	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9950	0.9873	0.9665	0.8962	0.7497	0.5379	0.3722	0.4205	0.6919	0.9351	0.9882	0.9962	(94)
Useful gains	394.8234	467.7581	522.5484	555.5609	498.9959	355.7790	236.0597	247.5542	370.7058	425.6728	393.2446	375.2455	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	964.5162	936.6890	850.0148	710.2573	544.6142	361.8265	236.7149	248.8060	392.7244	598.2944	794.4268	959.9888	(97)
Space heating kWh													
	423.8515	315.1216	243.6350	111.3814	33.9400	0.0000	0.0000	0.0000	0.0000	128.4305	288.8511	435.0491	(98a)
Space heating requirement - total per year (kWh/year)												1980.2601	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	423.8515	315.1216	243.6350	111.3814	33.9400	0.0000	0.0000	0.0000	0.0000	128.4305	288.8511	435.0491	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1980.2601	
Space heating per m2											(98c) / (4) =	38.2290	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	591.1310	465.3585	477.0318	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9258	0.9651	0.9484	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	547.2886	449.1011	452.3967	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	745.4805	715.3195	663.4468	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	142.6981	198.0665	157.0213	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	35.6745	49.5166	39.2553	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												124.4465	(107)
Energy for space heating												38.2290	(99)
Energy for space cooling												2.4024	(108)
Total												40.6314	(109)
Fabric Energy Efficiency (TFEE)												40.6	(109)

Full SAP Calculation Printout

Plot Reference	P-21	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-21
Plot Address	Flat 1, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.84	**TER**	15.85
Environmental	96 A	**% DER < TER**			63.15
CO_2 Emissions (t/year)	0.24	**DFEE**	41.38	**TFEE**	40.63
Compliance Check	See BREL	**% DFEE < TFEE**			-1.84
% DPER < TPER	28.66	**DPER**	60.25	**TPER**	84.46

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8000 (1b)	x	2.5500 (2b)	=	132.0900	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0900	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.1420	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2899	0.2869	0.2839	0.2688	0.2658	0.2507	0.2507	0.2476	0.2567	0.2658	0.2718	0.2778	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			14.3800	1.2357	17.7700			(27)
Ground Floor			51.8000	0.1200	6.2160	110.0000	5698.0000	(28a)
Brickwork	28.7300	14.3800	14.3500	0.2100	3.0135	110.0000	1578.4999	(29a)
Communal Wall	22.1900	2.0600	20.1300	0.2200	4.4286	110.0000	2214.3001	(29a)
Stairwell Wall	14.0300		14.0300	0.1600	2.2448	110.0000	1543.3000	(29a)
Total net area of external elements Aum(A, m2)			116.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1449			(33)
Main dwelling								
Party Wall 1			16.0000	0.0000	0.0000	110.0000	1760.0000	(32)
Party Ceiling 1			51.8000			30.0000	1554.0000	(32b)
Internal Wall 1			104.8200			9.0000	943.3800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15291.4800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		295.2023 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	7.9500	0.0540	0.4293
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0970	-0.2571
P1 Party wall - Ground floor	6.0400	0.1080	0.6523
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.8900	0.0500	0.3445
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	5.3000	0.0310	0.1643

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3060 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.4508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.6363	12.5048	12.3733	11.7156	11.5841	10.9264	10.9264	10.7949	11.1895	11.5841	11.8471	12.1102	(38)
Heat transfer coeff	54.0872	53.9556	53.8241	53.1664	53.0349	52.3772	52.3772	52.2457	52.6403	53.0349	53.2980	53.5610	(39)

Average = Sum(39)m / 12 = 53.1336

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0442	1.0416	1.0391	1.0264	1.0238	1.0111	1.0111	1.0086	1.0162	1.0238	1.0289	1.0340	(40)
HLP (average)												1.0257	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7432 (42)

Hot water usage for mixer showers

53.4467	52.6435	51.4731	49.2337	47.5811	45.7381	44.6906	45.8521	47.1254	49.1042	51.3917	53.2420	(42a)

Hot water usage for baths

23.1071	22.7639	22.2806	21.3896	20.7224	19.9826	19.5830	20.0628	20.5853	21.3770	22.2864	23.0290	(42b)

Hot water usage for other uses

32.4818	31.3007	30.1195	28.9383	27.7572	26.5760	26.5760	27.7572	28.9383	30.1195	31.3007	32.4818	(42c)

Average daily hot water use (litres/day) 100.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0356	106.7081	103.8733	99.5617	96.0607	92.2967	90.8496	93.6722	96.6491	100.6007	104.9787	108.7527	(44)
Energy conte	172.6858	151.9509	159.6493	136.2949	129.3162	113.4896	109.8747	115.9857	119.1780	136.5142	149.5615	170.2805	(45)

Energy content (annual) Total = Sum(45)m = 1664.7813

Distribution loss (46)m = 0.15 x (45)m

25.9029	22.7926	23.9474	20.4442	19.3974	17.0234	16.4812	17.3979	17.8767	20.4771	22.4342	25.5421	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(64)

Total per year (kWh/year) = Sum(64)m = 2009.7063 (64)

12Total per year (kWh/year) 2010 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.4180	50.5237	53.0834	45.3181	42.9976	37.7353	36.5333	38.5653	39.6267	45.3910	49.7292	56.6183	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6197	84.8289	76.6197	79.1737	76.6197	79.1737	76.6197	76.6197	79.1737	76.6197	79.1737	76.6197	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.9071	153.4834	149.5112	141.0547	130.3798	120.3470	113.6445	112.0681	116.0404	124.4969	135.1717	145.2046	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	(71)
Water heating gains (Table 5)	77.1748	75.1840	71.3487	62.9418	57.7925	52.4101	49.1039	51.8350	55.0371	61.0094	69.0683	76.0998	(72)
Total internal gains	354.8491	362.6440	346.6271	332.3177	313.9396	301.0784	288.5157	289.6704	299.3987	311.2736	332.5613	347.0716	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.1300	19.6403	0.3100	0.0000	0.7700	56.8670	(76)
South	2.2500	46.7521	0.3100	0.0000	0.7700	25.1094	(78)

Solar gains	81.9764	152.3666	235.5860	326.3948	389.1465	394.5780	377.1398	330.4636	267.7929	176.3550	100.6697	68.4615	(83)
Total gains	436.8255	515.0106	582.2130	658.7124	703.0861	695.6564	665.6555	620.1340	567.1916	487.6286	433.2310	415.5331	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.5331	78.7246	78.9169	79.8931	80.0913	81.0969	81.0969	81.3011	80.6917	80.0913	79.6960	79.3045	
alpha	6.2355	6.2483	6.2611	6.3262	6.3394	6.4065	6.4065	6.4201	6.3794	6.3394	6.3131	6.2870	
util living area	0.9944	0.9841	0.9540	0.8531	0.6776	0.4795	0.3460	0.3870	0.6264	0.9108	0.9857	0.9958	(86)
MIT	20.1365	20.3333	20.5852	20.8497	20.9690	20.9970	20.9997	20.9994	20.9854	20.8015	20.4206	20.1034	(87)
Th 2	20.0467	20.0488	20.0509	20.0614	20.0635	20.0741	20.0741	20.0762	20.0698	20.0635	20.0593	20.0551	(88)
util rest of house	0.9924	0.9786	0.9389	0.8146	0.6179	0.4113	0.2733	0.3096	0.5483	0.8759	0.9797	0.9943	(89)
MIT 2	19.0584	19.3079	19.6187	19.9267	20.0418	20.0727	20.0740	20.0760	20.0620	19.8862	19.4285	19.0229	(90)
Living area fraction										fLA = Living area / (4) =		0.4187	(91)
MIT	19.5098	19.7373	20.0234	20.3132	20.4300	20.4597	20.4616	20.4626	20.4487	20.2694	19.8439	19.4753	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5098	19.7373	20.0234	20.3132	20.4300	20.4597	20.4616	20.4626	20.4487	20.2694	19.8439	19.4753	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9764	0.9384	0.8256	0.6418	0.4399	0.3037	0.3420	0.5808	0.8845	0.9780	0.9930	(94)
Useful gains	432.8284	502.8431	546.3373	543.8482	451.2617	306.0068	202.1916	212.1125	329.3994	431.3078	423.6978	412.6227	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	822.6552	800.5544	727.8847	606.7972	462.9973	306.9159	202.2598	212.2556	334.1959	512.8182	679.2255	818.1613	(97)
Space heating kWh	290.0311	200.0620	135.0713	45.3232	8.7313	0.0000	0.0000	0.0000	0.0000	60.6437	183.9799	301.7208	(98a)
Space heating requirement - total per year (kWh/year)												1225.5634	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	290.0311	200.0620	135.0713	45.3232	8.7313	0.0000	0.0000	0.0000	0.0000	60.6437	183.9799	301.7208	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1225.5634	
Space heating per m2											(98c) / (4) =	23.6595	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	290.0311	200.0620	135.0713	45.3232	8.7313	0.0000	0.0000	0.0000	0.0000	60.6437	183.9799	301.7208	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	290.0311	200.0620	135.0713	45.3232	8.7313	0.0000	0.0000	0.0000	0.0000	60.6437	183.9799	301.7208	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.8475	49.3304	52.2429	45.5242	43.8558	39.2185	38.4803	40.1700	40.7913	45.8461	49.1923	55.1824	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0409	7.2628	8.0409	7.7815	8.0409	7.7815	8.0409	8.0409	7.7815	8.0409	7.7815	8.0409	(231)
Lighting	15.5947	12.5106	11.2644	8.2528	6.3747	5.2082	5.8152	7.5588	9.8182	12.8820	14.5502	16.0281	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1225.5634	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.6817	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.6755	(230a)
Total electricity for the above, kWh/year	94.6755	(231)
Electricity for lighting (calculated in Appendix L)	125.8579	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2001.7785	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1225.5634	0.1573	192.7937	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.6817	0.1411	78.3991	(264)
Space and water heating			271.1927	(265)
Pumps, fans and electric keep-hot	94.6755	0.1387	13.1327	(267)
Energy for lighting	125.8579	0.1443	18.1652	(268)
Total CO2, kg/year			302.4905	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1225.5634	1.5823	1939.2574	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.6817	1.5217	845.5781	(278)
Space and water heating			2784.8356	(279)
Pumps, fans and electric keep-hot	94.6755	1.5128	143.2251	(281)
Energy for lighting	125.8579	1.5338	193.0450	(282)
Total Primary energy kWh/year			3121.1056	(286)
Dwelling Primary energy Rate (DPER)			60.2500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8000	(1b)	x 2.5500	(2b) =	132.0900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0900	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1514	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4014	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3412	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4350	0.4265	0.4180	0.3753	0.3668	0.3241	0.3241	0.3156	0.3412	0.3668	0.3839	0.4009	(22b)
Effective ac	0.5946	0.5910	0.5873	0.5704	0.5673	0.5525	0.5525	0.5498	0.5582	0.5673	0.5737	0.5804	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8800	1.1450	12.4580			(27)
Ground Floor			51.8000	0.1300	6.7340			(28a)
Brickwork	28.7300	10.8800	17.8500	0.1800	3.2130			(29a)
Communal Wall	22.1900	2.0600	20.1300	0.1800	3.6234			(29a)
Stairwell Wall	14.0300		14.0300	0.1800	2.5254			(29a)
Total net area of external elements Aum(A, m2)			116.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.6138			(33)
Main dwelling								
Party Wall 1			16.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 295.2023 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0700	1.7150
E16 Corner (normal)	7.9500	0.0900	0.7155
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0900	-0.2385
P1 Party wall - Ground floor	6.0400	0.0800	0.4832
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.8900	0.0500	0.3445
E4 Jamb	18.6000	0.0500	0.9300
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	5.3000	0.0600	0.3180

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1877 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.8015 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9196	25.7594	25.6024	24.8650	24.7270	24.0848	24.0848	23.9658	24.3322	24.7270	25.0061	25.2979	(38)
Heat transfer coeff	64.7211	64.5609	64.4039	63.6665	63.5285	62.8863	62.8863	62.7673	63.1337	63.5285	63.8076	64.0994	(39)
Average = Sum(39)m / 12 =												63.6658	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2494	1.2463	1.2433	1.2291	1.2264	1.2140	1.2140	1.2117	1.2188	1.2264	1.2318	1.2374	(40)
HLP (average)												1.2291	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7432 (42)

Hot water usage for mixer showers

53.4467	52.6435	51.4731	49.2337	47.5811	45.7381	44.6906	45.8521	47.1254	49.1042	51.3917	53.2420	(42a)

Hot water usage for baths

23.1071	22.7639	22.2806	21.3896	20.7224	19.9826	19.5830	20.0628	20.5853	21.3770	22.2864	23.0290	(42b)

Hot water usage for other uses

32.4818	31.3007	30.1195	28.9383	27.7572	26.5760	26.5760	27.7572	28.9383	30.1195	31.3007	32.4818	(42c)

Average daily hot water use (litres/day) 100.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0356	106.7081	103.8733	99.5617	96.0607	92.2967	90.8496	93.6722	96.6491	100.6007	104.9787	108.7527	(44)
Energy conte	172.6858	151.9509	159.6493	136.2949	129.3162	113.4896	109.8747	115.9857	119.1780	136.5142	149.5615	170.2805	(45)
Energy content (annual)										Total = Sum(45)m =		1664.7813	
Distribution loss (46)m = 0.15 x (45)m	25.9029	22.7926	23.9474	20.4442	19.3974	17.0234	16.4812	17.3979	17.8767	20.4771	22.4342	25.5421	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	219.2807	194.0366	206.2442	181.3868	175.9111	158.5815	156.4696	162.5806	164.2699	183.1091	194.6533	216.8754	(62)
WWHRS	-24.4336	-21.6093	-22.6280	-18.7369	-17.4621	-14.9424	-14.0062	-14.8941	-15.4600	-18.2257	-20.6475	-23.9811	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.8471	172.4273	183.6162	162.6499	158.4490	143.6390	142.4634	147.6865	148.8098	164.8834	174.0058	192.8943	(64)
										Total per year (kWh/year) = Sum(64)m =		1986.3718	(64)
12Total per year (kWh/year)												1986	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	94.6939	84.1922	90.3593	81.3915	80.2735	73.8088	73.8093	75.8412	75.7002	82.6669	85.8027	93.8942	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	87.1585	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.8289	85.0605	76.8289	79.3898	76.8289	79.3898	76.8289	76.8289	79.3898	76.8289	79.3898	76.8289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.9071	153.4834	149.5112	141.0547	130.3798	120.3470	113.6445	112.0681	116.0404	124.4969	135.1717	145.2046	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	31.7159	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	(71)

Water heating gains (Table 5)

	127.2768	125.2861	121.4507	113.0438	107.8946	102.5122	99.2060	101.9371	105.1391	111.1114	119.1704	126.2019 (72)

Total internal gains

	408.1603	415.9776	399.9383	385.6358	367.2508	351.3966	338.8269	339.9816	349.7169	364.5848	385.8795	400.3828 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.1800	19.6403	0.6300	0.7000	0.7700	55.1013	(76)
South	1.7000	46.7521	0.6300	0.7000	0.7700	24.2897	(78)

Solar gains	79.3910	147.5700	228.1874	316.1657	376.9650	382.2316	365.3370	320.1128	259.3906	170.8084	97.4964	66.3011	(83)
Total gains	487.5513	563.5476	628.1257	701.8016	744.2158	733.6281	704.1639	660.0944	609.1075	535.3932	483.3759	466.6840	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.6298	65.7927	65.9530	66.7169	66.8618	67.5447	67.5447	67.6727	67.2800	66.8618	66.5694	66.2663	
alpha	5.3753	5.3862	5.3969	5.4478	5.4575	5.5030	5.5030	5.5115	5.4853	5.4575	5.4380	5.4178	
util living area	0.9923	0.9827	0.9582	0.8814	0.7339	0.5393	0.3915	0.4348	0.6786	0.9190	0.9829	0.9939	(86)
MIT	19.9359	20.1340	20.4077	20.7286	20.9202	20.9878	20.9982	20.9969	20.9601	20.6982	20.2639	19.9052	(87)
Th 2	19.8807	19.8831	19.8855	19.8968	19.8989	19.9088	19.9088	19.9106	19.9050	19.8989	19.8946	19.8902	(88)
util rest of house	0.9895	0.9765	0.9434	0.8439	0.6666	0.4518	0.2952	0.3333	0.5863	0.8835	0.9756	0.9916	(89)
MIT 2	18.6777	18.9289	19.2685	19.6493	19.8421	19.9033	19.9084	19.9098	19.8835	19.6287	19.1038	18.6460	(90)
Living area fraction									fLA = Living area / (4) =			0.4187	(91)
MIT	19.2045	19.4335	19.7455	20.1012	20.2935	20.3574	20.3647	20.3650	20.3343	20.0766	19.5896	19.1733	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2045	19.4335	19.7455	20.1012	20.2935	20.3574	20.3647	20.3650	20.3343	20.0766	19.5896	19.1733	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9872	0.9733	0.9412	0.8516	0.6919	0.4883	0.3357	0.3759	0.6240	0.8901	0.9730	0.9896	(94)
Useful gains	481.3147	548.5212	591.1621	597.6537	514.9253	358.2585	236.3596	248.1559	380.1083	476.5756	470.3101	461.8144	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	964.6375	938.2960	853.0618	713.1428	545.9335	362.0607	236.7501	248.8743	393.5959	602.0317	796.9297	959.7768	(97)
Space heating kWh	359.5922	261.9286	194.8534	83.1521	23.0701	0.0000	0.0000	0.0000	0.0000	93.3393	235.1662	370.4841	(98a)
Space heating requirement - total per year (kWh/year)												1621.5859	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	359.5922	261.9286	194.8534	83.1521	23.0701	0.0000	0.0000	0.0000	0.0000	93.3393	235.1662	370.4841	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1621.5859	
Space heating per m2										(98c) / (4) =		31.3047	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	359.5922	261.9286	194.8534	83.1521	23.0701	0.0000	0.0000	0.0000	0.0000	93.3393	235.1662	370.4841	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	389.5906	283.7797	211.1087	90.0890	24.9947	0.0000	0.0000	0.0000	0.0000	101.1260	254.7846	401.3912	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	194.8471	172.4273	183.6162	162.6499	158.4490	143.6390	142.4634	147.6865	148.8098	164.8834	174.0058	192.8943	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4146	84.9947	84.1932	82.6332	80.8413	79.8000	79.8000	79.8000	79.8000	82.8347	84.7359	85.4985	(217)
Fuel for water heating, kWh/month	228.1192	202.8684	218.0891	196.8337	195.9999	179.9988	178.5256	185.0708	186.4785	199.0512	205.3508	225.6114	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9635	12.8065	11.5309	8.4480	6.5255	5.3314	5.9528	7.7376	10.0504	13.1867	14.8943	16.4072	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.0160	-20.8404	-31.5826	-37.5150	-42.2406	-40.1064	-39.6379	-36.5384	-31.3741	-24.7183	-15.7946	-11.9963	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-4.9454	-10.6416	-21.5952	-33.0888	-44.3864	-44.8111	-44.2637	-37.1701	-26.8567	-15.4096	-6.6653	-3.8918 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1756.8644	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2401.9973	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.8347	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-640.0862	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3733.6103	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1756.8644	0.2100	368.9415	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2401.9973	0.2100	504.4194	(264)
Space and water heating			873.3610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.8347	0.1443	18.5948	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.3606	0.1335	-46.2262	
PV Unit electricity exported	-293.7256	0.1253	-36.8117	
Total			-83.0379	(269)
Total CO2, kg/year			820.8472	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1756.8644	1.1300	1985.2568	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2401.9973	1.1300	2714.2570	(278)
Space and water heating			4699.5138	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.8347	1.5338	197.6110	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-346.3606	1.4932	-517.1825	
PV Unit electricity exported	-293.7256	0.4600	-135.1166	
Total			-652.2992	(283)
Total Primary energy kWh/year			4374.9265	(286)
Target Primary Energy Rate (TPER)			84.4600	(287)

Full SAP Calculation Printout

Plot Reference	P-21	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-21
Plot Address	Flat 1, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.84	**TER**	15.85
Environmental	96 A	**% DER < TER**			63.15
CO_2 Emissions (t/year)	0.24	**DFEE**	41.38	**TFEE**	40.63
Compliance Check	See BREL	**% DFEE < TFEE**			-1.84
% DPER < TPER	28.66	**DPER**	60.25	**TPER**	84.46

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8000 (1b)	x	2.5500 (2b)	=	132.0900	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0900	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.1420	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2899	0.2869	0.2839	0.2688	0.2658	0.2507	0.2507	0.2476	0.2567	0.2658	0.2718	0.2778	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			14.3800	1.2357	17.7700			(27)
Ground Floor			51.8000	0.1200	6.2160	110.0000	5698.0000	(28a)
Brickwork	28.7300	14.3800	14.3500	0.2100	3.0135	110.0000	1578.4999	(29a)
Communal Wall	22.1900	2.0600	20.1300	0.2200	4.4286	110.0000	2214.3001	(29a)
Stairwell Wall	14.0300		14.0300	0.1600	2.2448	110.0000	1543.3000	(29a)
Total net area of external elements Aum(A, m2)			116.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1449			(33)
Main dwelling								
Party Wall 1			16.0000	0.0000	0.0000	110.0000	1760.0000	(32)
Party Ceiling 1			51.8000			30.0000	1554.0000	(32b)
Internal Wall 1			104.8200			9.0000	943.3800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15291.4800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		295.2023 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	7.9500	0.0540	0.4293
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0970	-0.2571
P1 Party wall - Ground floor	6.0400	0.1080	0.6523
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.8900	0.0500	0.3445
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	5.3000	0.0310	0.1643

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3060 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.4508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.6363	12.5048	12.3733	11.7156	11.5841	10.9264	10.9264	10.7949	11.1895	11.5841	11.8471	12.1102	(38)
Heat transfer coeff	54.0872	53.9556	53.8241	53.1664	53.0349	52.3772	52.3772	52.2457	52.6403	53.0349	53.2980	53.5610	(39)

Average = Sum(39)m / 12 = 53.1336

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0442	1.0416	1.0391	1.0264	1.0238	1.0111	1.0111	1.0086	1.0162	1.0238	1.0289	1.0340	(40)
HLP (average)												1.0257	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7432 (42)

Hot water usage for mixer showers

53.4467	52.6435	51.4731	49.2337	47.5811	45.7381	44.6906	45.8521	47.1254	49.1042	51.3917	53.2420	(42a)

Hot water usage for baths

23.1071	22.7639	22.2806	21.3896	20.7224	19.9826	19.5830	20.0628	20.5853	21.3770	22.2864	23.0290	(42b)

Hot water usage for other uses

32.4818	31.3007	30.1195	28.9383	27.7572	26.5760	26.5760	27.7572	28.9383	30.1195	31.3007	32.4818	(42c)

Average daily hot water use (litres/day) 100.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0356	106.7081	103.8733	99.5617	96.0607	92.2967	90.8496	93.6722	96.6491	100.6007	104.9787	108.7527	(44)
Energy conte	172.6858	151.9509	159.6493	136.2949	129.3162	113.4896	109.8747	115.9857	119.1780	136.5142	149.5615	170.2805	(45)
Energy content (annual)										Total = Sum(45)m =		1664.7813	
Distribution loss (46)m = 0.15 x (45)m	25.9029	22.7926	23.9474	20.4442	19.3974	17.0234	16.4812	17.3979	17.8767	20.4771	22.4342	25.5421	(46)

Water storage loss (or HIU loss):

Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(64)

Total per year (kWh/year) = Sum(64)m = 2009.7063 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.4180	50.5237	53.0834	45.3181	42.9976	37.7353	36.5333	38.5653	39.6267	45.3910	49.7292	56.6183	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8165	15.8244	12.8693	9.7429	7.2829	6.1486	6.6437	8.6358	11.5909	14.7173	17.1773	18.3117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.7270	229.0798	223.1510	210.5293	194.5968	179.6224	169.6186	167.2659	173.1947	185.8163	201.7489	216.7232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	(71)
Water heating gains (Table 5)	77.1748	75.1840	71.3487	62.9418	57.7925	52.4101	49.1039	51.8350	55.0371	61.0094	69.0683	76.0998	(72)
Total internal gains	403.7839	402.1538	389.4345	365.2796	341.7378	320.2467	307.4319	309.8023	321.8882	343.6086	370.0601	393.2003	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.1300	19.6403	0.3100	0.0000	0.7700	56.8670	(76)
South	2.2500	46.7521	0.3100	0.0000	0.7700	25.1094	(78)

Solar gains	81.9764	152.3666	235.5860	326.3948	389.1465	394.5780	377.1398	330.4636	267.7929	176.3550	100.6697	68.4615	(83)

Total gains	485.7603	554.5205	625.0205	691.6744	730.8843	714.8247	684.5717	640.2659	589.6811	519.9636	470.7297	461.6618	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.5331	78.7246	78.9169	79.8931	80.0913	81.0969	81.0969	81.3011	80.6917	80.0913	79.6960	79.3045	
alpha	6.2355	6.2483	6.2611	6.3262	6.3394	6.4065	6.4065	6.4201	6.3794	6.3394	6.3131	6.2870	
util living area													
	0.9902	0.9772	0.9381	0.8303	0.6556	0.4670	0.3364	0.3749	0.6049	0.8879	0.9784	0.9926	(86)
MIT	20.2224	20.3979	20.6422	20.8725	20.9741	20.9974	20.9997	20.9995	20.9879	20.8339	20.4825	20.1854	(87)
Th 2	20.0467	20.0488	20.0509	20.0614	20.0635	20.0741	20.0741	20.0762	20.0698	20.0635	20.0593	20.0551	(88)
util rest of house													
	0.9868	0.9697	0.9193	0.7894	0.5966	0.4004	0.2658	0.2999	0.5284	0.8480	0.9699	0.9900	(89)
MIT 2	19.1668	19.3877	19.6848	19.9491	20.0456	20.0729	20.0740	20.0760	20.0635	19.9190	19.5046	19.1268	(90)
Living area fraction										fLA = Living area / (4) =		0.4187	(91)
MIT	19.6088	19.8107	20.0857	20.3357	20.4344	20.4600	20.4616	20.4627	20.4506	20.3021	19.9141	19.5700	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6088	19.8107	20.0857	20.3357	20.4344	20.4600	20.4616	20.4627	20.4506	20.3021	19.9141	19.5700	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9848	0.9674	0.9201	0.8021	0.6204	0.4283	0.2954	0.3313	0.5602	0.8592	0.9683	0.9883	(94)
Useful gains	478.3854	536.4578	575.0523	554.7668	453.4654	306.1512	202.2035	212.1403	330.3617	446.7452	455.7887	456.2396	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	828.0081	804.5150	731.2357	607.9970	463.2272	306.9311	202.2613	212.2588	334.2964	514.5476	682.9636	823.2356	(97)
Space heating kWh													
	260.1193	180.1344	116.2004	38.3257	7.2628	0.0000	0.0000	0.0000	0.0000	50.4450	163.5659	273.0450	(98a)
Space heating requirement - total per year (kWh/year)												1089.0985	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	260.1193	180.1344	116.2004	38.3257	7.2628	0.0000	0.0000	0.0000	0.0000	50.4450	163.5659	273.0450	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1089.0985	
Space heating per m2											(98c) / (4) =	21.0251	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	260.1193	180.1344	116.2004	38.3257	7.2628	0.0000	0.0000	0.0000	0.0000	50.4450	163.5659	273.0450	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	260.1193	180.1344	116.2004	38.3257	7.2628	0.0000	0.0000	0.0000	0.0000	50.4450	163.5659	273.0450	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.8475	49.3304	52.2429	45.5242	43.8558	39.2185	38.4803	40.1700	40.7913	45.8461	49.1923	55.1824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0409	7.2628	8.0409	7.7815	8.0409	7.7815	8.0409	8.0409	7.7815	8.0409	7.7815	8.0409	(231)
Lighting	15.5947	12.5106	11.2644	8.2528	6.3747	5.2082	5.8152	7.5588	9.8182	12.8820	14.5502	16.0281	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1089.0985	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.6817	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)

mechanical ventilation fans (SFP = 0.5875)	94.6755	(230a)
Total electricity for the above, kWh/year	94.6755	(231)
Electricity for lighting (calculated in Appendix L)	125.8579	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1865.3136	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1089.0985	16.4900	179.5923	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.6817	16.4900	91.6319	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6755	16.4900	15.6120	(249)
Energy for lighting	125.8579	16.4900	20.7540	(250)
Additional standing charges			0.0000	(251)
Total energy cost			307.5902	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1439	(257)
SAP value		81.4569	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1089.0985	0.1575	171.5042	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.6817	0.1411	78.3991	(264)
Space and water heating			249.9032	(265)
Pumps, fans and electric keep-hot	94.6755	0.1387	13.1327	(267)
Energy for lighting	125.8579	0.1443	18.1652	(268)
Total CO2, kg/year			281.2011	(272)
CO2 emissions per m2			5.4300	(273)
EI value			96.1073	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8000	(1b) x	2.5500	(2b) =	132.0900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.0900	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.1420	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1207 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1298	0.1237	0.1237	0.1147	0.1177	0.1026	0.1026	0.0996	0.1026	0.1147	0.1116	0.1207	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2658	0.2597	0.2597	0.2507	0.2537	0.2386	0.2386	0.2356	0.2386	0.2507	0.2476	0.2567	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			14.3800	1.2357	17.7700			(27)
Ground Floor			51.8000	0.1200	6.2160	110.0000	5698.0000	(28a)
Brickwork	28.7300	14.3800	14.3500	0.2100	3.0135	110.0000	1578.4999	(29a)
Communal Wall	22.1900	2.0600	20.1300	0.2200	4.4286	110.0000	2214.3001	(29a)
Stairwell Wall	14.0300		14.0300	0.1600	2.2448	110.0000	1543.3000	(29a)
Total net area of external elements Aum(A, m2)			116.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1449			(33)
Main dwelling								
Party Wall 1			16.0000	0.0000	0.0000	110.0000	1760.0000	(32)
Party Ceiling 1			51.8000			30.0000	1554.0000	(32b)
Internal Wall 1			104.8200			9.0000	943.3800	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15291.4800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 295.2023 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	7.9500	0.0540	0.4293
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0970	-0.2571
P1 Party wall - Ground floor	6.0400	0.1080	0.6523
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.8900	0.0500	0.3445
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	5.3000	0.0310	0.1643

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3060 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.4508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.5841	11.3210	11.3210	10.9264	11.0579	10.4003	10.4003	10.2688	10.4003	10.9264	10.7949	11.1895	(38)
Heat transfer coeff	53.0349	52.7718	52.7718	52.3772	52.5088	51.8511	51.8511	51.7196	51.8511	52.3772	52.2457	52.6403	(39)
Average = Sum(39)m / 12 =												52.3334	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0238	1.0188	1.0188	1.0111	1.0137	1.0010	1.0010	0.9984	1.0010	1.0111	1.0086	1.0162	(40)
HLP (average)												1.0103	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7432 (42)
Hot water usage for mixer showers

53.4467	52.6435	51.4731	49.2337	47.5811	45.7381	44.6906	45.8521	47.1254	49.1042	51.3917	53.2420	(42a)

Hot water usage for baths

23.1071	22.7639	22.2806	21.3896	20.7224	19.9826	19.5830	20.0628	20.5853	21.3770	22.2864	23.0290	(42b)

Hot water usage for other uses

32.4818	31.3007	30.1195	28.9383	27.7572	26.5760	26.5760	27.7572	28.9383	30.1195	31.3007	32.4818	(42c)

Average daily hot water use (litres/day) 100.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0356	106.7081	103.8733	99.5617	96.0607	92.2967	90.8496	93.6722	96.6491	100.6007	104.9787	108.7527	(44)
Energy conte	172.6858	151.9509	159.6493	136.2949	129.3162	113.4896	109.8747	115.9857	119.1780	136.5142	149.5615	170.2805	(45)
Energy content (annual)										Total = Sum(45)m =		1664.7813	
Distribution loss (46)m = 0.15 x (45)m	25.9029	22.7926	23.9474	20.4442	19.3974	17.0234	16.4812	17.3979	17.8767	20.4771	22.4342	25.5421	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(64)
									Total per year (kWh/year) = Sum(64)m =		2009.7063	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
57.4180	50.5237	53.0834	45.3181	42.9976	37.7353	36.5333	38.5653	39.6267	45.3910	49.7292	56.6183	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m 104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

17.8165	15.8244	12.8693	9.7429	7.2829	6.1486	6.6437	8.6358	11.5909	14.7173	17.1773	18.3117	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

226.7270	229.0798	223.1510	210.5293	194.5968	179.6224	169.6186	167.2659	173.1947	185.8163	201.7489	216.7232	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	(69)

Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	(71)

Water heating gains (Table 5)

77.1748	75.1840	71.3487	62.9418	57.7925	52.4101	49.1039	51.8350	55.0371	61.0094	69.0683	76.0998	(72)

Total internal gains

403.7839	402.1538	389.4345	365.2796	341.7378	320.2467	307.4319	309.8023	321.8882	343.6086	370.0601	393.2003	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.1300	23.8018	0.3100	0.0000	0.7700	68.9164	(76)
South	2.2500	54.2217	0.3100	0.0000	0.7700	29.1211	(78)

Solar gains	98.0375	159.3116	244.6417	344.2513	400.0898	429.2629	406.1817	364.7285	296.4863	197.9468	118.6209	82.3327	(83)
Total gains	501.8214	561.4654	634.0762	709.5309	741.8276	749.5096	713.6136	674.5308	618.3745	541.5554	488.6810	475.5330	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau 80.0913	80.4905	80.4905	81.0969	80.8938	81.9198	81.9198	82.1281	81.9198	81.0969	81.3011	80.6917	
alpha 6.3394	6.3660	6.3660	6.4065	6.3929	6.4613	6.4613	6.4752	6.4613	6.4065	6.4201	6.3794	
util living area 0.9846	0.9676	0.9115	0.7658	0.5662	0.3594	0.2398	0.2607	0.5001	0.8257	0.9629	0.9881	(86)
MIT 20.3548	20.5115	20.7416	20.9296	20.9903	20.9996	21.0000	21.0000	20.9966	20.9067	20.6135	20.3208	(87)
Th 2 20.0635	20.0677	20.0677	20.0741	20.0719	20.0825	20.0825	20.0846	20.0825	20.0741	20.0762	20.0698	(88)
util rest of house 0.9792	0.9570	0.8860	0.7171	0.5044	0.2962	0.1731	0.1905	0.4252	0.7724	0.9485	0.9838	(89)
MIT 2 19.3469	19.5435	19.8145	20.0168	20.0661	20.0824	20.0825	20.0846	20.0811	20.0009	19.6783	19.3097	(90)
Living area fraction								fLA = Living area / (4) =			0.4187	(91)
MIT 19.7689	19.9488	20.2027	20.3990	20.4531	20.4664	20.4667	20.4679	20.4644	20.3801	20.0699	19.7331	(92)
Temperature adjustment											0.0000	
adjusted MIT 19.7689	19.9488	20.2027	20.3990	20.4531	20.4664	20.4667	20.4679	20.4644	20.3801	20.0699	19.7331	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation 0.9770	0.9554	0.8901	0.7349	0.5300	0.3227	0.2010	0.2199	0.4566	0.7912	0.9484	0.9818	(94)
Useful gains 490.3035	536.3999	564.3650	521.4227	393.2001	241.8491	143.4516	148.3201	282.3420	428.4774	463.4802	466.8992	(95)
Ext temp. 5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W 777.9663	751.9379	675.6215	549.9113	396.6033	241.9592	143.4552	148.3265	283.3360	465.1177	630.5998	770.2904	(97)
Space heating kWh 214.0211	144.8415	82.7748	20.5118	2.5319	0.0000	0.0000	0.0000	0.0000	27.2604	120.3261	225.7231	(98a)
Space heating requirement - total per year (kWh/year)											837.9908	
Solar heating kWh 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)											0.0000	
Space heating kWh 214.0211	144.8415	82.7748	20.5118	2.5319	0.0000	0.0000	0.0000	0.0000	27.2604	120.3261	225.7231	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)											837.9908	
Space heating per m2										(98c) / (4) =	16.1774	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement 214.0211	144.8415	82.7748	20.5118	2.5319	0.0000	0.0000	0.0000	0.0000	27.2604	120.3261	225.7231	(98)
Space heating efficiency (main heating system 1) 100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system) 214.0211	144.8415	82.7748	20.5118	2.5319	0.0000	0.0000	0.0000	0.0000	27.2604	120.3261	225.7231	(211)
Space heating efficiency (main heating system 2) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement												
	201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755 (64)
Efficiency of water heater												361.6650 (216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)
Fuel for water heating, kWh/month												
	55.8475	49.3304	52.2429	45.5242	43.8558	39.2185	38.4803	40.1700	40.7913	45.8461	49.1923	55.1824 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	8.0409	7.2628	8.0409	7.7815	8.0409	7.7815	8.0409	8.0409	7.7815	8.0409	7.7815	8.0409 (231)
Lighting	15.5947	12.5106	11.2644	8.2528	6.3747	5.2082	5.8152	7.5588	9.8182	12.8820	14.5502	16.0281 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	837.9908 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	361.6650
Water heating fuel used	555.6817 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)	
mechanical ventilation fans (SFP = 0.5875)	94.6755 (230a)
Total electricity for the above, kWh/year	94.6755 (231)
Electricity for lighting (calculated in Appendix L)	125.8579 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1614.2059 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	837.9908	27.6700	231.8720	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.6817	27.6700	153.7571	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6755	27.6700	26.1967	(249)
Energy for lighting	125.8579	27.6700	34.8249	(250)
Additional standing charges			0.0000	(251)
Total energy cost			446.6508	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	837.9908	0.1583	132.6616	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.6817	0.1411	78.3991	(264)
Space and water heating			211.0606	(265)
Pumps, fans and electric keep-hot	94.6755	0.1387	13.1327	(267)
Energy for lighting	125.8579	0.1443	18.1652	(268)
Total CO2, kg/year			242.3584	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	837.9908	1.5860	1329.0609	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.6817	1.5217	845.5781	(278)
Space and water heating			2174.6390	(279)
Pumps, fans and electric keep-hot	94.6755	1.5128	143.2251	(281)
Energy for lighting	125.8579	1.5338	193.0450	(282)
Total Primary energy kWh/year			2510.9091	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£447	£447	£0
Space heating	£258	£258	£0
Water heating	£154	£154	£0
Lighting	£35	£35	£0
Total cost of fuels	£447	£447	£0
Total cost of uses	£447	£447	£0
Delivered energy	31 kWh/m²	31 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	48 kWh/m²	48 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.8000 (1b)	x	2.5500 (2b)	=	132.0900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	132.0900	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.8400	(17)
Infiltration rate			0.1420	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1207	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2899	0.2869	0.2839	0.2688	0.2658	0.2507	0.2507	0.2476	0.2567	0.2658	0.2718	0.2778	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			14.3800	1.2357	17.7700			(27)
Ground Floor			51.8000	0.1200	6.2160	110.0000	5698.0000	(28a)
Brickwork	28.7300	14.3800	14.3500	0.2100	3.0135	110.0000	1578.4999	(29a)
Communal Wall	22.1900	2.0600	20.1300	0.2200	4.4286	110.0000	2214.3001	(29a)
Stairwell Wall	14.0300		14.0300	0.1600	2.2448	110.0000	1543.3000	(29a)
Total net area of external elements Aum(A, m2)			116.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1449			(33)
Main dwelling								
Party Wall 1			16.0000	0.0000	0.0000	110.0000	1760.0000	(32)
Party Ceiling 1			51.8000			30.0000	1554.0000	(32b)
Internal Wall 1			104.8200			9.0000	943.3800	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15291.4800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 295.2023 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	7.9500	0.0540	0.4293
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0970	-0.2571
P1 Party wall - Ground floor	6.0400	0.1080	0.6523
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.8900	0.0500	0.3445
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	5.3000	0.0310	0.1643

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3060 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.4508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.6363	12.5048	12.3733	11.7156	11.5841	10.9264	10.9264	10.7949	11.1895	11.5841	11.8471	12.1102	(38)
Heat transfer coeff	54.0872	53.9556	53.8241	53.1664	53.0349	52.3772	52.3772	52.2457	52.6403	53.0349	53.2980	53.5610	(39)
Average = Sum(39)m / 12 =												53.1336	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0442	1.0416	1.0391	1.0264	1.0238	1.0111	1.0111	1.0086	1.0162	1.0238	1.0289	1.0340	(40)
HLP (average)												1.0257	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7432 (42)
Hot water usage for mixer showers

53.4467	52.6435	51.4731	49.2337	47.5811	45.7381	44.6906	45.8521	47.1254	49.1042	51.3917	53.2420	(42a)

Hot water usage for baths

23.1071	22.7639	22.2806	21.3896	20.7224	19.9826	19.5830	20.0628	20.5853	21.3770	22.2864	23.0290	(42b)

Hot water usage for other uses

32.4818	31.3007	30.1195	28.9383	27.7572	26.5760	26.5760	27.7572	28.9383	30.1195	31.3007	32.4818	(42c)

Average daily hot water use (litres/day) 100.2289 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.0356	106.7081	103.8733	99.5617	96.0607	92.2967	90.8496	93.6722	96.6491	100.6007	104.9787	108.7527	(44)
Energy conte	172.6858	151.9509	159.6493	136.2949	129.3162	113.4896	109.8747	115.9857	119.1780	136.5142	149.5615	170.2805	(45)
Energy content (annual)										Total = Sum(45)m =		1664.7813	
Distribution loss (46)m = 0.15 x (45)m	25.9029	22.7926	23.9474	20.4442	19.3974	17.0234	16.4812	17.3979	17.8767	20.4771	22.4342	25.5421	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(64)

Total per year (kWh/year) = Sum(64)m = 2009.7063 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

57.4180	50.5237	53.0834	45.3181	42.9976	37.7353	36.5333	38.5653	39.6267	45.3910	49.7292	56.6183	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8165	15.8244	12.8693	9.7429	7.2829	6.1486	6.6437	8.6358	11.5909	14.7173	17.1773	18.3117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.7270	229.0798	223.1510	210.5293	194.5968	179.6224	169.6186	167.2659	173.1947	185.8163	201.7489	216.7232	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	(71)
Water heating gains (Table 5)												
	77.1748	75.1840	71.3487	62.9418	57.7925	52.4101	49.1039	51.8350	55.0371	61.0094	69.0683	76.0998 (72)
Total internal gains												
	403.7839	402.1538	389.4345	365.2796	341.7378	320.2467	307.4319	309.8023	321.8882	343.6086	370.0601	393.2003 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.1300	19.6403	0.3100	0.0000	0.7700	56.8670	(76)
South	2.2500	46.7521	0.3100	0.0000	0.7700	25.1094	(78)

Solar gains	81.9764	152.3666	235.5860	326.3948	389.1465	394.5780	377.1398	330.4636	267.7929	176.3550	100.6697	68.4615	(83)
Total gains	485.7603	554.5205	625.0205	691.6744	730.8843	714.8247	684.5717	640.2659	589.6811	519.9636	470.7297	461.6618	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.5331	78.7246	78.9169	79.8931	80.0913	81.0969	81.0969	81.3011	80.6917	80.0913	79.6960	79.3045	
alpha	6.2355	6.2483	6.2611	6.3262	6.3394	6.4065	6.4065	6.4201	6.3794	6.3394	6.3131	6.2870	
util living area													
	0.9902	0.9772	0.9381	0.8303	0.6556	0.4670	0.3364	0.3749	0.6049	0.8879	0.9784	0.9926	(86)
MIT	20.2224	20.3979	20.6422	20.8725	20.9741	20.9974	20.9997	20.9995	20.9879	20.8339	20.4825	20.1854	(87)
Th 2	20.0467	20.0488	20.0509	20.0614	20.0635	20.0741	20.0741	20.0762	20.0698	20.0635	20.0593	20.0551	(88)
util rest of house													
	0.9868	0.9697	0.9193	0.7894	0.5966	0.4004	0.2658	0.2999	0.5284	0.8480	0.9699	0.9900	(89)
MIT 2	19.1668	19.3877	19.6848	19.9491	20.0456	20.0729	20.0740	20.0760	20.0635	19.9190	19.5046	19.1268	(90)
Living area fraction										fLA = Living area / (4) =		0.4187	(91)
MIT	19.6088	19.8107	20.0857	20.3357	20.4344	20.4600	20.4616	20.4627	20.4506	20.3021	19.9141	19.5700	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6088	19.8107	20.0857	20.3357	20.4344	20.4600	20.4616	20.4627	20.4506	20.3021	19.9141	19.5700	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9848	0.9674	0.9201	0.8021	0.6204	0.4283	0.2954	0.3313	0.5602	0.8592	0.9683	0.9883	(94)
Useful gains	478.3854	536.4578	575.0523	554.7668	453.4654	306.1512	202.2035	212.1403	330.3617	446.7452	455.7887	456.2396	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	828.0081	804.5150	731.2357	607.9970	463.2272	306.9311	202.2613	212.2588	334.2964	514.5476	682.9636	823.2356	(97)
Space heating kWh													
	260.1193	180.1344	116.2004	38.3257	7.2628	0.0000	0.0000	0.0000	0.0000	50.4450	163.5659	273.0450	(98a)
Space heating requirement - total per year (kWh/year)												1089.0985	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	260.1193	180.1344	116.2004	38.3257	7.2628	0.0000	0.0000	0.0000	0.0000	50.4450	163.5659	273.0450	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1089.0985	
Space heating per m2											(98c) / (4) =	21.0251	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	260.1193	180.1344	116.2004	38.3257	7.2628	0.0000	0.0000	0.0000	0.0000	50.4450	163.5659	273.0450	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	260.1193	180.1344	116.2004	38.3257	7.2628	0.0000	0.0000	0.0000	0.0000	50.4450	163.5659	273.0450	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.8475	49.3304	52.2429	45.5242	43.8558	39.2185	38.4803	40.1700	40.7913	45.8461	49.1923	55.1824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0409	7.2628	8.0409	7.7815	8.0409	7.7815	8.0409	8.0409	7.7815	8.0409	7.7815	8.0409	(231)
Lighting	15.5947	12.5106	11.2644	8.2528	6.3747	5.2082	5.8152	7.5588	9.8182	12.8820	14.5502	16.0281	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1089.0985	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.6817	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.6755	(230a)
Total electricity for the above, kWh/year	94.6755	(231)
Electricity for lighting (calculated in Appendix L)	125.8579	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1865.3136	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1089.0985	16.4900	179.5923	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.6817	16.4900	91.6319	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6755	16.4900	15.6120	(249)
Energy for lighting	125.8579	16.4900	20.7540	(250)
Additional standing charges			0.0000	(251)
Total energy cost			307.5902	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1439	(257)
SAP value		81.4569	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1089.0985	0.1575	171.5042	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.6817	0.1411	78.3991	(264)
Space and water heating			249.9032	(265)
Pumps, fans and electric keep-hot	94.6755	0.1387	13.1327	(267)
Energy for lighting	125.8579	0.1443	18.1652	(268)
Total CO2, kg/year			281.2011	(272)
CO2 emissions per m2			5.4300	(273)
EI value			96.1073	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		51.8000	(1b)	x 2.5500	(2b) =	132.0900	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.8000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		132.0900	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.1420	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1298	0.1237	0.1237	0.1147	0.1177	0.1026	0.1026	0.0996	0.1026	0.1147	0.1116	0.1207	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2658	0.2597	0.2597	0.2507	0.2537	0.2386	0.2386	0.2356	0.2386	0.2507	0.2476	0.2567	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			14.3800	1.2357	17.7700			(27)
Ground Floor			51.8000	0.1200	6.2160	110.0000	5698.0000	(28a)
Brickwork	28.7300	14.3800	14.3500	0.2100	3.0135	110.0000	1578.4999	(29a)
Communal Wall	22.1900	2.0600	20.1300	0.2200	4.4286	110.0000	2214.3001	(29a)
Stairwell Wall	14.0300		14.0300	0.1600	2.2448	110.0000	1543.3000	(29a)
Total net area of external elements Aum(A, m2)			116.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1449			(33)
Main dwelling								
Party Wall 1			16.0000	0.0000	0.0000	110.0000	1760.0000	(32)
Party Ceiling 1			51.8000			30.0000	1554.0000	(32b)
Internal Wall 1			104.8200			9.0000	943.3800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15291.4800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		295.2023 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	24.5000	0.0380	0.9310
E16 Corner (normal)	7.9500	0.0540	0.4293
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0970	-0.2571
P1 Party wall - Ground floor	6.0400	0.1080	0.6523
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.8900	0.0500	0.3445
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	5.3000	0.0310	0.1643

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.3060 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.4508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.5841	11.3210	11.3210	10.9264	11.0579	10.4003	10.4003	10.2688	10.4003	10.9264	10.7949	11.1895	(38)
Heat transfer coeff	53.0349	52.7718	52.7718	52.3772	52.5088	51.8511	51.8511	51.7196	51.8511	52.3772	52.2457	52.6403	(39)
Average = Sum(39)m / 12 =												52.3334	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0238	1.0188	1.0188	1.0111	1.0137	1.0010	1.0010	0.9984	1.0010	1.0111	1.0086	1.0162	(40)
HLP (average)												1.0103	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7432	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.4467	52.6435	51.4731	49.2337	47.5811	45.7381	44.6906	45.8521	47.1254	49.1042	51.3917	53.2420	(42a)

Hot water usage for baths

23.1071	22.7639	22.2806	21.3896	20.7224	19.9826	19.5830	20.0628	20.5853	21.3770	22.2864	23.0290	(42b)

Hot water usage for other uses

32.4818	31.3007	30.1195	28.9383	27.7572	26.5760	26.5760	27.7572	28.9383	30.1195	31.3007	32.4818	(42c)

Average daily hot water use (litres/day)	100.2289 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
109.0356	106.7081	103.8733	99.5617	96.0607	92.2967	90.8496	93.6722	96.6491	100.6007	104.9787	108.7527	(44)
Energy conte 172.6858	151.9509	159.6493	136.2949	129.3162	113.4896	109.8747	115.9857	119.1780	136.5142	149.5615	170.2805	(45)
Energy content (annual)										Total = Sum(45)m =		1664.7813	
Distribution loss (46)m = 0.15 x (45)m													
25.9029	22.7926	23.9474	20.4442	19.3974	17.0234	16.4812	17.3979	17.8767	20.4771	22.4342	25.5421	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950 (56)

If cylinder contains dedicated solar storage

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755 (64)

Total per year (kWh/year) = Sum(64)m = 2009.7063 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	57.4180	50.5237	53.0834	45.3181	42.9976	37.7353	36.5333	38.5653	39.6267	45.3910	49.7292	56.6183 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	104.5902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.8165	15.8244	12.8693	9.7429	7.2829	6.1486	6.6437	8.6358	11.5909	14.7173	17.1773	18.3117 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	226.7270	229.0798	223.1510	210.5293	194.5968	179.6224	169.6186	167.2659	173.1947	185.8163	201.7489	216.7232 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022	47.2022 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268	-69.7268 (71)

Water heating gains (Table 5)

	77.1748	75.1840	71.3487	62.9418	57.7925	52.4101	49.1039	51.8350	55.0371	61.0094	69.0683	76.0998 (72)

Total internal gains

	403.7839	402.1538	389.4345	365.2796	341.7378	320.2467	307.4319	309.8023	321.8882	343.6086	370.0601	393.2003 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.1300	23.8018	0.3100	0.0000	0.7700	68.9164	(76)
South	2.2500	54.2217	0.3100	0.0000	0.7700	29.1211	(78)

Solar gains	98.0375	159.3116	244.6417	344.2513	400.0898	429.2629	406.1817	364.7285	296.4863	197.9468	118.6209	82.3327 (83)
Total gains	501.8214	561.4654	634.0762	709.5309	741.8276	749.5096	713.6136	674.5308	618.3745	541.5554	488.6810	475.5330 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.0913	80.4905	80.4905	81.0969	80.8938	81.9198	81.9198	82.1281	81.9198	81.0969	81.3011	80.6917	
alpha	6.3394	6.3660	6.3660	6.4065	6.3929	6.4613	6.4613	6.4752	6.4613	6.4065	6.4201	6.3794	
util living area													
	0.9846	0.9676	0.9115	0.7658	0.5662	0.3594	0.2398	0.2607	0.5001	0.8257	0.9629	0.9881	(86)
MIT	20.3548	20.5115	20.7416	20.9296	20.9903	20.9996	21.0000	21.0000	20.9966	20.9067	20.6135	20.3208	(87)
Th 2	20.0635	20.0677	20.0677	20.0741	20.0719	20.0825	20.0825	20.0846	20.0825	20.0741	20.0762	20.0698	(88)
util rest of house													
	0.9792	0.9570	0.8860	0.7171	0.5044	0.2962	0.1731	0.1905	0.4252	0.7724	0.9485	0.9838	(89)
MIT 2	19.3469	19.5435	19.8145	20.0168	20.0661	20.0824	20.0825	20.0846	20.0811	20.0009	19.6783	19.3097	(90)
Living area fraction									fLA = Living area / (4) =			0.4187	(91)
MIT	19.7689	19.9488	20.2027	20.3990	20.4531	20.4664	20.4667	20.4679	20.4644	20.3801	20.0699	19.7331	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7689	19.9488	20.2027	20.3990	20.4531	20.4664	20.4667	20.4679	20.4644	20.3801	20.0699	19.7331	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9770	0.9554	0.8901	0.7349	0.5300	0.3227	0.2010	0.2199	0.4566	0.7912	0.9484	0.9818	(94)
Useful gains	490.3035	536.3999	564.3650	521.4227	393.2001	241.8491	143.4516	148.3201	282.3420	428.4774	463.4802	466.8992	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	777.9663	751.9379	675.6215	549.9113	396.6033	241.9592	143.4552	148.3265	283.3360	465.1177	630.5998	770.2904	(97)
Space heating kWh													
	214.0211	144.8415	82.7748	20.5118	2.5319	0.0000	0.0000	0.0000	0.0000	27.2604	120.3261	225.7231	(98a)
Space heating requirement - total per year (kWh/year)												837.9908	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	214.0211	144.8415	82.7748	20.5118	2.5319	0.0000	0.0000	0.0000	0.0000	27.2604	120.3261	225.7231	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												837.9908	
Space heating per m2											(98c) / (4) =	16.1774	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	214.0211	144.8415	82.7748	20.5118	2.5319	0.0000	0.0000	0.0000	0.0000	27.2604	120.3261	225.7231	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	214.0211	144.8415	82.7748	20.5118	2.5319	0.0000	0.0000	0.0000	0.0000	27.2604	120.3261	225.7231	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	201.9808	178.4109	188.9443	164.6449	158.6112	141.8396	139.1697	145.2807	147.5280	165.8092	177.9115	199.5755	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.8475	49.3304	52.2429	45.5242	43.8558	39.2185	38.4803	40.1700	40.7913	45.8461	49.1923	55.1824	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0409	7.2628	8.0409	7.7815	8.0409	7.7815	8.0409	8.0409	7.7815	8.0409	7.7815	8.0409	(231)
Lighting	15.5947	12.5106	11.2644	8.2528	6.3747	5.2082	5.8152	7.5588	9.8182	12.8820	14.5502	16.0281	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												837.9908	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.6817	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												94.6755	(230a)
Total electricity for the above, kWh/year												94.6755	(231)
Electricity for lighting (calculated in Appendix L)												125.8579	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1614.2059	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	837.9908	27.6700	231.8720	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.6817	27.6700	153.7571	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.6755	27.6700	26.1967	(249)
Energy for lighting	125.8579	27.6700	34.8249	(250)
Additional standing charges			0.0000	(251)
Total energy cost			446.6508	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	837.9908	0.1583	132.6616	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.6817	0.1411	78.3991	(264)
Space and water heating			211.0606	(265)
Pumps, fans and electric keep-hot	94.6755	0.1387	13.1327	(267)
Energy for lighting	125.8579	0.1443	18.1652	(268)
Total CO2, kg/year			242.3584	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	837.9908	1.5860	1329.0609	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.6817	1.5217	845.5781	(278)
Space and water heating			2174.6390	(279)
Pumps, fans and electric keep-hot	94.6755	1.5128	143.2251	(281)
Energy for lighting	125.8579	1.5338	193.0450	(282)
Total Primary energy kWh/year			2510.9091	(286)

Summary for Input Data

Plot Reference	P-22	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-22
Plot Address	Flat 2, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	80 C	**DER**	4.90	**TER**	12.43
Environmental	96 A	**% DER < TER**			60.58
CO_2 Emissions (t/year)	0.37	**DFEE**	37.37	**TFEE**	37.89
Compliance Check	See BREL	**% DFEE < TFEE**			1.37
% DPER < TPER	23.08	**DPER**	50.50	**TPER**	65.65

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	268.75	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	38.18 m	93.07 m²	2.55 m

8.0 Living Area	34.65	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	87.27	68.18	0.00	None	19.09	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	13.90	11.84	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	15.94	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	158.47

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	93.07

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)

Summary for Input Data

Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	93.07

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	North	2.06	
Patio Door	Window-Red	Brickwork	South	2.53	
East	Window-Red	Brickwork	East	5.06	
South East	Window-Red	Brickwork	South East	7.01	
West	Window	Brickwork	West	4.48	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	38.18	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	15.90	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.30	-0.10	-0.10	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	6.03	0.11	0.11	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	6.03	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	8.72	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	33.79	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	38.18	0.11	0.11	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No

Y-value	0.04	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	2
Manufacturer SFP	0.49
Duct Type	Rigid
MVHR Efficiency	90.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0

Summary for Input Data

Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.56	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	9
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

Summary for Input Data

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-22	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-22
Plot Address	Flat 2, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	80 C	**DER**	4.90	**TER**	12.43
Environmental	96 A	**% DER < TER**			60.58
CO_2 Emissions (t/year)	0.37	**DFEE**	37.37	**TFEE**	37.89
Compliance Check	See BREL	**% DFEE < TFEE**			1.37
% DPER < TPER	23.08	**DPER**	50.50	**TPER**	65.65

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	93.0700 (1b)	x	2.5500 (2b)	=	237.3285	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.3285	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5600	(17)
Infiltration rate		0.1280	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1088	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1387	0.1360	0.1333	0.1197	0.1170	0.1034	0.1034	0.1006	0.1088	0.1170	0.1224	0.1278	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000	(23c)
Effective ac	0.2787	0.2760	0.2733	0.2597	0.2570	0.2434	0.2434	0.2406	0.2488	0.2570	0.2624	0.2678	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			4.8800	1.1450	5.1298			(27)
Window-Red			14.6000	1.2357	18.0418			(27)
Ground Floor			93.0700	0.1200	11.1684	110.0000	10237.7000	(28a)
Brickwork	87.2700	19.0800	68.1900	0.2100	14.3199	110.0000	7500.8996	(29a)
Communal Wall	13.9000	2.0600	11.8400	0.2200	2.6048	110.0000	1302.4000	(29a)
Total net area of external elements Aum(A, m2)			194.2400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.7367			(33)
Main dwelling								
Party Wall 1			15.9400	0.0000	0.0000	110.0000	1753.4000	(32)
Party Ceiling 1			93.0700			30.0000	2792.1000	(32b)
Internal Wall 1			158.4700			9.0000	1426.2300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		25012.7296	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							268.7518	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.1800	0.0380	1.4508
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0970	-0.5141
P1 Party wall - Ground floor	6.0300	0.1080	0.6512
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.7200	0.0500	0.4360
E4 Jamb	33.7900	0.0160	0.5406
E5 Ground floor (normal)	38.1800	0.1120	4.2762
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.7877 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.5244 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.8289	21.6159	21.4029	20.3377	20.1247	19.0596	19.0596	18.8465	19.4856	20.1247	20.5507	20.9768	(38)
Heat transfer coeff	83.3533	83.1403	82.9273	81.8621	81.6491	80.5840	80.5840	80.3710	81.0100	81.6491	82.0752	82.5012	(39)

Average = Sum(39)m / 12 = 81.8089

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8956	0.8933	0.8910	0.8796	0.8773	0.8658	0.8658	0.8636	0.8704	0.8773	0.8819	0.8864	(40)
HLP (average)												0.8790	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6655 (42)

Hot water usage for mixer showers

68.9107	67.8751	66.3660	63.4787	61.3479	58.9717	57.6211	59.1187	60.7604	63.3117	66.2611	68.6466	(42a)

Hot water usage for baths

29.7571	29.3151	28.6928	27.5453	26.6861	25.7334	25.2187	25.8367	26.5096	27.5291	28.7002	29.6565	(42b)

Hot water usage for other uses

41.9269	40.4023	38.8777	37.3531	35.8284	34.3038	34.3038	35.8284	37.3531	38.8777	40.4023	41.9269	(42c)

Average daily hot water use (litres/day) 129.2382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5946	137.5925	133.9365	128.3771	123.8625	119.0089	117.1436	120.7839	124.6230	129.7185	135.3635	140.2300	(44)
Energy conte	222.6675	195.9298	205.8554	175.7418	166.7427	146.3353	141.6751	149.5557	153.6727	176.0267	192.8501	219.5663	(45)

Energy content (annual) Total = Sum(45)m = 2146.6190

Distribution loss (46)m = 0.15 x (45)m

33.4001	29.3895	30.8783	26.3613	25.0114	21.9503	21.2513	22.4333	23.0509	26.4040	28.9275	32.9349	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)

Total per year (kWh/year) = Sum(64)m = 2491.5440 (64)

12Total per year (kWh/year) 2492 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

74.0369	65.1467	68.4469	58.4341	55.4419	48.6565	47.1070	49.7273	51.0962	58.5289	64.1227	73.0058	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.9536	137.2343	123.9536	128.0854	123.9536	128.0854	123.9536	123.9536	128.0854	123.9536	128.0854	123.9536	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.6137	247.1521	240.7556	227.1382	209.9487	193.7930	183.0000	180.4616	186.8581	200.4755	217.6650	233.8207	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	(71)
Water heating gains (Table 5)	99.5120	96.9445	91.9985	81.1585	74.5187	67.5785	63.3158	66.8377	70.9669	78.6679	89.0593	98.1261	(72)
Total internal gains	531.0611	544.3126	519.6895	499.3639	471.4028	452.4386	433.2511	434.2347	448.8922	466.0787	497.7914	518.8822	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.4800	19.6403	0.3300	0.0000	0.7700	22.3578	(80)
East	5.0600	19.6403	0.3100	0.0000	0.7700	23.7219	(76)
Southeast	7.0100	36.7938	0.3100	0.0000	0.7700	61.5666	(77)
South	2.5300	46.7521	0.3100	0.0000	0.7700	28.2341	(78)

Solar gains	135.8805	241.2528	350.8413	460.8679	533.8480	536.0797	514.4255	460.1497	389.5522	272.7398	164.6657	114.9788	(83)
Total gains	666.9416	785.5654	870.5308	960.2318	1005.2508	988.5182	947.6766	894.3844	838.4444	738.8185	662.4572	633.8610	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.3558	83.5693	83.7840	84.8742	85.0956	86.2204	86.2204	86.4489	85.7669	85.0956	84.6539	84.2167	
alpha	6.5571	6.5713	6.5856	6.6583	6.6730	6.7480	6.7480	6.7633	6.7178	6.6730	6.6436	6.6144	
util living area	0.9958	0.9873	0.9640	0.8825	0.7232	0.5186	0.3738	0.4127	0.6514	0.9218	0.9885	0.9969	(86)
MIT	20.1724	20.3596	20.5866	20.8368	20.9631	20.9965	20.9997	20.9994	20.9854	20.8082	20.4460	20.1411	(87)
Th 2	20.1712	20.1732	20.1751	20.1849	20.1868	20.1966	20.1966	20.1986	20.1927	20.1868	20.1829	20.1790	(88)
util rest of house	0.9944	0.9833	0.9529	0.8520	0.6703	0.4550	0.3058	0.3412	0.5817	0.8934	0.9841	0.9959	(89)
MIT 2	19.2087	19.4472	19.7305	20.0303	20.1589	20.1948	20.1965	20.1984	20.1841	20.0072	19.5659	19.1750	(90)
Living area fraction									fLA = Living area / (4) =			0.3723	(91)
MIT	19.5675	19.7869	20.0493	20.3305	20.4583	20.4933	20.4955	20.4966	20.4824	20.3054	19.8936	19.5347	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5675	19.7869	20.0493	20.3305	20.4583	20.4933	20.4955	20.4966	20.4824	20.3054	19.8936	19.5347	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9810	0.9510	0.8579	0.6885	0.4786	0.3311	0.3679	0.6073	0.8981	0.9822	0.9948	(94)
Useful gains	662.3178	770.6180	827.8506	823.7981	692.1578	473.1449	313.7967	329.0054	509.1476	663.4974	650.6451	630.5720	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1272.5951	1237.7021	1123.6027	935.7287	715.1096	474.9041	313.9181	329.2470	517.0406	792.4397	1050.0355	1265.1290	(97)
Space heating kWh	454.0463	313.8805	220.0396	80.5900	17.0761	0.0000	0.0000	0.0000	0.0000	95.9330	287.5611	472.1104	(98a)
Space heating requirement - total per year (kWh/year)												1941.2370	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	454.0463	313.8805	220.0396	80.5900	17.0761	0.0000	0.0000	0.0000	0.0000	95.9330	287.5611	472.1104	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1941.2370	
Space heating per m2										(98c) / (4) =		20.8578	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	454.0463	313.8805	220.0396	80.5900	17.0761	0.0000	0.0000	0.0000	0.0000	95.9330	287.5611	472.1104	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	454.0463	313.8805	220.0396	80.5900	17.0761	0.0000	0.0000	0.0000	0.0000	95.9330	287.5611	472.1104	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.6674	61.4906	65.0188	56.4312	54.2042	48.3003	47.2730	49.4520	50.3291	56.7712	61.1616	68.8099	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.0621	13.6044	15.0621	14.5762	15.0621	14.5762	15.0621	15.0621	14.5762	15.0621	14.5762	15.0621	(231)
Lighting	25.2287	20.2394	18.2233	13.3512	10.3128	8.4257	9.4077	12.2285	15.8836	20.8402	23.5389	25.9299	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1941.2370	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	688.9094	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	177.3437	(230a)
Total electricity for the above, kWh/year	177.3437	(231)
Electricity for lighting (calculated in Appendix L)	203.6099	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3011.1000	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1941.2370	0.1572	305.0975	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	688.9094	0.1412	97.2612	(264)
Space and water heating			402.3587	(265)
Pumps, fans and electric keep-hot	177.3437	0.1387	24.5998	(267)
Energy for lighting	203.6099	0.1443	29.3872	(268)
Total CO2, kg/year			456.3457	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.9000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1941.2370	1.5818	3070.6793	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	688.9094	1.5221	1048.5556	(278)
Space and water heating			4119.2349	(279)
Pumps, fans and electric keep-hot	177.3437	1.5128	268.2856	(281)
Energy for lighting	203.6099	1.5338	312.3037	(282)
Total Primary energy kWh/year			4699.8242	(286)
Dwelling Primary energy Rate (DPER)			50.5000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	93.0700 (1b)	x	2.5500 (2b)	=	237.3285 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 93.0700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.3285	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1264	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3764	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3199	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4079	0.3999	0.3919	0.3519	0.3439	0.3039	0.3039	0.2960	0.3199	0.3439	0.3599	0.3759	(22b)
Effective ac	0.5832	0.5800	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5512	0.5591	0.5648	0.5707	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			19.0800	1.1450	21.8473			(27)
Ground Floor			93.0700	0.1300	12.0991			(28a)
Brickwork	87.2700	19.0800	68.1900	0.1800	12.2742			(29a)
Communal Wall	13.9000	2.0600	11.8400	0.1800	2.1312			(29a)
Total net area of external elements Aum(A, m2)			194.2400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.4118			(33)
Main dwelling								
Party Wall 1			15.9400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 268.7518 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.1800	0.0700	2.6726
E16 Corner (normal)	15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770
P1 Party wall - Ground floor	6.0300	0.0800	0.4824
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.7200	0.0500	0.4360
E4 Jamb	33.7900	0.0500	1.6895
E5 Ground floor (normal)	38.1800	0.1600	6.1088
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.5143 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 62.9261 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.6756	45.4226	45.1745	44.0095	43.7916	42.7769	42.7769	42.5890	43.1678	43.7916	44.2325	44.6935	(38)
Heat transfer coeff	108.6017	108.3487	108.1007	106.9357	106.7177	105.7030	105.7030	105.5151	106.0939	106.7177	107.1586	107.6196	(39)

Average = Sum(39)m / 12 = 106.9346

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1669	1.1642	1.1615	1.1490	1.1466	1.1357	1.1357	1.1337	1.1399	1.1466	1.1514	1.1563	(40)
HLP (average)												1.1490	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6655 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.9107	67.8751	66.3660	63.4787	61.3479	58.9717	57.6211	59.1187	60.7604	63.3117	66.2611	68.6466	(42a)
Hot water usage for baths	29.7571	29.3151	28.6928	27.5453	26.6861	25.7334	25.2187	25.8367	26.5096	27.5291	28.7002	29.6565	(42b)
Hot water usage for other uses	41.9269	40.4023	38.8777	37.3531	35.8284	34.3038	34.3038	35.8284	37.3531	38.8777	40.4023	41.9269	(42c)

Average daily hot water use (litres/day) 129.2382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5946	137.5925	133.9365	128.3771	123.8625	119.0089	117.1436	120.7839	124.6230	129.7185	135.3635	140.2300	(44)
Energy conte	222.6675	195.9298	205.8554	175.7418	166.7427	146.3353	141.6751	149.5557	153.6727	176.0267	192.8501	219.5663	(45)
Energy content (annual)										Total = Sum(45)m =		2146.6190	
Distribution loss (46)m = 0.15 x (45)m	33.4001	29.3895	30.8783	26.3613	25.0114	21.9503	21.2513	22.4333	23.0509	26.4040	28.9275	32.9349	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	269.2624	238.0156	252.4503	220.8336	213.3376	191.4272	188.2700	196.1506	198.7645	222.6216	237.9420	266.1612	(62)
WWHRS	-31.5031	-27.8616	-29.1750	-24.1581	-22.5145	-19.2658	-18.0586	-19.2035	-19.9331	-23.4990	-26.6215	-30.9197	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	237.7593	210.1540	223.2752	196.6755	190.8231	172.1614	170.2114	176.9470	178.8314	199.1227	211.3205	235.2415	(64)
										Total per year (kWh/year) = Sum(64)m =		2402.5230	(64)
12Total per year (kWh/year)												2403	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3129	98.8152	105.7228	94.5076	92.7179	84.7300	84.3829	87.0032	87.1696	95.8048	100.1961	110.2817	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.9536	137.2343	123.9536	128.0854	123.9536	128.0854	123.9536	123.9536	128.0854	123.9536	128.0854	123.9536	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.6137	247.1521	240.7556	227.1382	209.9487	193.7930	183.0000	180.4616	186.8581	200.4755	217.6650	233.8207	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	(71)
Water heating gains (Table 5)													
	149.6141	147.0465	142.1006	131.2606	124.6208	117.6805	113.4179	116.9398	121.0689	128.7699	139.1613	148.2281	(72)
Total internal gains													
	584.1632	597.4147	572.7915	552.4659	524.5048	502.5406	483.3532	484.3368	498.9942	519.1808	550.8935	571.9842	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.0600	19.6403	0.6300	0.7000	0.7700	30.3717	(76)
Southeast	7.0100	36.7938	0.6300	0.7000	0.7700	78.8252	(77)
South	2.5300	46.7521	0.6300	0.7000	0.7700	36.1487	(78)
West	4.4800	19.6403	0.6300	0.7000	0.7700	26.8904	(80)

Solar gains	172.2360	305.4876	443.6010	581.9083	673.5079	676.1286	648.8948	580.7771	492.2522	345.1679	208.6621	145.7833	(83)
Total gains	756.3992	902.9023	1016.3925	1134.3742	1198.0127	1178.6693	1132.2479	1065.1139	991.2464	864.3487	759.5556	717.7675	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.9767	64.1261	64.2732	64.9735	65.1062	65.7311	65.7311	65.8482	65.4890	65.1062	64.8383	64.5605	
alpha	5.2651	5.2751	5.2849	5.3316	5.3404	5.3821	5.3821	5.3899	5.3659	5.3404	5.3226	5.3040	
util living area													
	0.9941	0.9848	0.9619	0.8919	0.7538	0.5613	0.4087	0.4521	0.6941	0.9268	0.9862	0.9955	(86)
MIT	19.8490	20.0724	20.3599	20.6931	20.9027	20.9837	20.9975	20.9958	20.9520	20.6641	20.1951	19.8123	(87)
Th 2	19.9466	19.9488	19.9509	19.9610	19.9629	19.9718	19.9718	19.9734	19.9684	19.9629	19.9591	19.9551	(88)
util rest of house													
	0.9921	0.9798	0.9493	0.8591	0.6919	0.4768	0.3143	0.3531	0.6078	0.8965	0.9807	0.9939	(89)
MIT 2	18.6266	18.9106	19.2697	19.6704	19.8891	19.9636	19.9711	19.9721	19.9402	19.6498	19.0760	18.5863	(90)
Living area fraction									fLA = Living area / (4) =			0.3723	(91)
MIT	19.0817	19.3431	19.6756	20.0512	20.2665	20.3434	20.3532	20.3532	20.3169	20.0274	19.4927	19.0427	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0817	19.3431	19.6756	20.0512	20.2665	20.3434	20.3532	20.3532	20.3169	20.0274	19.4927	19.0427	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9898	0.9760	0.9453	0.8623	0.7111	0.5079	0.3496	0.3901	0.6384	0.8987	0.9775	0.9920	(94)
Useful gains	748.7207	881.2211	960.7923	978.1776	851.8542	598.6888	395.8134	415.5008	632.7714	776.7950	742.4356	712.0535	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1605.3179	1564.8941	1424.2934	1192.4573	914.1938	607.0931	396.7263	417.1270	659.5767	1006.0704	1327.9819	1597.3700	(97)
Space heating kWh													
	637.3083	459.4283	344.8448	154.2814	46.3806	0.0000	0.0000	0.0000	0.0000	170.5809	421.5933	658.6754	(98a)
Space heating requirement - total per year (kWh/year)												2893.0931	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	637.3083	459.4283	344.8448	154.2814	46.3806	0.0000	0.0000	0.0000	0.0000	170.5809	421.5933	658.6754	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2893.0931	
Space heating per m2											(98c) / (4) =	31.0851	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	637.3083	459.4283	344.8448	154.2814	46.3806	0.0000	0.0000	0.0000	0.0000	170.5809	421.5933	658.6754	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	690.4748	497.7555	373.6130	167.1521	50.2499	0.0000	0.0000	0.0000	0.0000	184.8114	456.7642	713.6245	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	237.7593	210.1540	223.2752	196.6755	190.8231	172.1614	170.2114	176.9470	178.8314	199.1227	211.3205	235.2415	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1598	85.7642	85.0311	83.5212	81.4134	79.8000	79.8000	79.8000	79.8000	83.7148	85.5775	86.2404	(217)
Fuel for water heating, kWh/month													
	275.9517	245.0371	262.5807	235.4797	234.3879	215.7411	213.2975	221.7382	224.0995	237.8584	246.9347	272.7740	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.7551	20.6617	18.6036	13.6298	10.5280	8.6015	9.6040	12.4837	16.2151	21.2750	24.0301	26.4709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.6011	-36.2687	-54.4832	-64.1013	-71.5907	-67.7036	-66.8546	-61.8782	-53.5473	-42.6979	-27.5963	-21.0866	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.4671	-20.2957	-41.0622	-62.7538	-84.0536	-84.8692	-83.8929	-70.5553	-51.0770	-29.4006	-12.7579	-7.4599	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3134.4454	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2885.8803	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	207.8584	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1150.0545	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5164.1297	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3134.4454	0.2100	658.2335	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2885.8803	0.2100	606.0349	(264)
Space and water heating			1264.2684	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	207.8584	0.1443	30.0004	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-592.4094	0.1337	-79.1848	
PV Unit electricity exported	-557.6450	0.1254	-69.9192	
Total			-149.1040	(269)
Total CO2, kg/year			1157.0940	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3134.4454	1.1300	3541.9233	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2885.8803	1.1300	3261.0448	(278)
Space and water heating			6802.9681	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	207.8584	1.5338	318.8202	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-592.4094	1.4940	-885.0323	
PV Unit electricity exported	-557.6450	0.4602	-256.6376	
Total			-1141.6699	(283)
Total Primary energy kWh/year			6110.2193	(286)
Target Primary Energy Rate (TPER)			65.6500	(287)

Full SAP Calculation Printout

Plot Reference	P-22	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-22
Plot Address	Flat 2, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	80 C	**DER**	4.90	**TER**	12.43
Environmental	96 A	**% DER < TER**			60.58
CO_2 Emissions (t/year)	0.37	**DFEE**	37.37	**TFEE**	37.89
Compliance Check	See BREL	**% DFEE < TFEE**			1.37
% DPER < TPER	23.08	**DPER**	50.50	**TPER**	65.65

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	93.0700	(1b)	x 2.5500	(2b) =	237.3285	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	237.3285	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1264 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5600 (17)
Infiltration rate		0.2544 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2757	0.2703	0.2649	0.2379	0.2325	0.2054	0.2054	0.2000	0.2162	0.2325	0.2433	0.2541	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5380	0.5365	0.5351	0.5283	0.5270	0.5211	0.5211	0.5200	0.5234	0.5270	0.5296	0.5323	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			4.4800	1.1450	5.1298			(27)
Window-Red			14.6000	1.2357	18.0418			(27)
Ground Floor			93.0700	0.1200	11.1684	110.0000	10237.7000	(28a)
Brickwork	87.2700	19.0800	68.1900	0.2100	14.3199	110.0000	7500.8996	(29a)
Communal Wall	13.9000	2.0600	11.8400	0.2200	2.6048	110.0000	1302.4000	(29a)
Total net area of external elements Aum(A, m2)			194.2400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.7367			(33)
Main dwelling								
Party Wall 1			15.9400	0.0000	0.0000	110.0000	1753.4000	(32)
Party Ceiling 1			93.0700			30.0000	2792.1000	(32b)
Internal Wall 1			158.4700			9.0000	1426.2300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		25012.7296	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							268.7518	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.1800	0.0380	1.4508

E16 Corner (normal)	15.9000	0.0540	0.8586	
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0970	-0.5141	
P1 Party wall - Ground floor	6.0300	0.1080	0.6512	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.7200	0.0500	0.4360	
E4 Jamb	33.7900	0.0160	0.5406	
E5 Ground floor (normal)	38.1800	0.1120	4.2762	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.7877 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.5244 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.1360	42.0204	41.9071	41.3749	41.2754	40.8118	40.8118	40.7260	40.9904	41.2754	41.4768	41.6874	(38)
Heat transfer coeff	103.6604	103.5448	103.4315	102.8993	102.7998	102.3363	102.3363	102.2504	102.5148	102.7998	103.0012	103.2118	(39)
Average = Sum(39)m / 12 =												102.8989	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1138	1.1125	1.1113	1.1056	1.1045	1.0996	1.0996	1.0986	1.1015	1.1045	1.1067	1.1090	(40)
HLP (average)												1.1056	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6655 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.7571	29.3151	28.6928	27.5453	26.6861	25.7334	25.2187	25.8367	26.5096	27.5291	28.7002	29.6565	(42b)

Hot water usage for other uses

41.9269	40.4023	38.8777	37.3531	35.8284	34.3038	34.3038	35.8284	37.3531	38.8777	40.4023	41.9269	(42c)

Average daily hot water use (litres/day) 65.7049 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.6840	69.7174	67.5705	64.8984	62.5145	60.0372	59.5226	61.6652	63.8627	66.4067	69.1025	71.5834	(44)
Energy conte	113.5299	99.2767	103.8533	88.8426	84.1566	73.8227	71.9874	76.3544	78.7490	90.1133	98.4491	112.0823	(45)
Energy content (annual)										Total = Sum(45)m =		1091.2173	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	96.5004	84.3852	88.2753	75.5162	71.5331	62.7493	61.1893	64.9012	66.9367	76.5963	83.6817	95.2699	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	96.5004	84.3852	88.2753	75.5162	71.5331	62.7493	61.1893	64.9012	66.9367	76.5963	83.6817	95.2699	(64)
										Total per year (kWh/year) = Sum(64)m =		927.5347	(64)
12Total per year (kWh/year)												928	(64)
Electric shower(s)	55.1859	49.1711	53.6930	51.2386	52.2000	49.7938	51.4536	52.2000	51.2386	53.6930	52.6834	55.1859	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		627.7369	(64a)
Heat gains from water heating, kWh/month	37.9216	33.3891	35.4921	31.6887	30.9333	28.1358	28.1607	29.2753	29.5438	32.5723	34.0913	37.6140	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.9536	137.2343	123.9536	128.0854	123.9536	128.0854	123.9536	123.9536	128.0854	123.9536	128.0854	123.9536	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.6137	247.1521	240.7556	227.1382	209.9487	193.7930	183.0000	180.4616	186.8581	200.4755	217.6650	233.8207	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	(71)
Water heating gains (Table 5)	50.9699	49.6861	47.7044	44.0121	41.5770	39.0775	37.8504	39.3485	41.0331	43.7800	47.3490	50.5564	(72)
Total internal gains	482.5190	497.0543	475.3953	462.2174	438.4610	423.9376	407.7857	406.7455	418.9584	431.1909	456.0812	471.3125	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.4800	19.6403	0.3300	0.0000	0.7700	22.3578	(80)
East	5.0600	19.6403	0.3100	0.0000	0.7700	23.7219	(76)
Southeast	7.0100	36.7938	0.3100	0.0000	0.7700	61.5666	(77)
South	2.5300	46.7521	0.3100	0.0000	0.7700	28.2341	(78)

Solar gains	135.8805	241.2528	350.8413	460.8679	533.8480	536.0797	514.4255	460.1497	389.5522	272.7398	164.6657	114.9788	(83)
Total gains	618.3995	738.3071	826.2366	923.0853	972.3090	960.0172	922.2112	866.8952	808.5106	703.9307	620.7469	586.2913	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.0264	67.1012	67.1747	67.5221	67.5875	67.8936	67.8936	67.9506	67.7754	67.5875	67.4553	67.3177	
alpha	5.4684	5.4734	5.4783	5.5015	5.5058	5.5262	5.5262	5.5300	5.5184	5.5058	5.4970	5.4878	
util living area	0.9977	0.9935	0.9825	0.9418	0.8391	0.6537	0.4835	0.5340	0.7849	0.9634	0.9942	0.9983	(86)
MIT	19.7810	19.9784	20.2469	20.5884	20.8463	20.9699	20.9951	20.9918	20.9202	20.5715	20.1077	19.7421	(87)
Th 2	19.9896	19.9906	19.9916	19.9963	19.9971	20.0012	20.0012	20.0019	19.9996	19.9971	19.9954	19.9935	(88)
util rest of house	0.9969	0.9912	0.9761	0.9206	0.7859	0.5639	0.3763	0.4227	0.7033	0.9456	0.9918	0.9977	(89)
MIT 2	18.8846	19.0815	19.3469	19.6763	19.8998	19.9887	20.0001	19.9999	19.9600	19.6679	19.2148	18.8490	(90)
Living area fraction										fLA = Living area / (4) =		0.3723	(91)
MIT	19.2183	19.4154	19.6820	20.0159	20.2522	20.3540	20.3706	20.3692	20.3175	20.0043	19.5472	19.1815	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2183	19.4154	19.6820	20.0159	20.2522	20.3540	20.3706	20.3692	20.3175	20.0043	19.5472	19.1815	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9960	0.9895	0.9736	0.9211	0.8007	0.5968	0.4164	0.4644	0.7313	0.9457	0.9903	0.9970	(94)
Useful gains	615.9228	730.5555	804.4508	850.2538	778.5156	572.9043	384.0389	402.5816	591.2878	665.7196	614.7520	584.5107	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1546.4389	1502.9932	1363.4335	1143.8166	879.1670	588.8429	385.8645	405.8513	637.3829	966.7631	1282.0761	1546.2710	(97)
Space heating kWh	692.3040	519.0782	415.8831	211.3652	74.8846	0.0000	0.0000	0.0000	0.0000	223.9764	480.4733	715.5496	(98a)
Space heating requirement - total per year (kWh/year)												3333.5144	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	692.3040	519.0782	415.8831	211.3652	74.8846	0.0000	0.0000	0.0000	0.0000	223.9764	480.4733	715.5496	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3333.5144	
Space heating per m2											(98c) / (4) =	35.8173	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	961.9609	757.2883	777.1032	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8889	0.9443	0.9234	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	855.1001	715.1078	717.5507	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1072.7200	1030.9473	968.7315	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	156.6863	234.9846	186.8785	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.1716	58.7461	46.7196	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												144.6373	(107)
Energy for space heating												35.8173	(99)
Energy for space cooling												1.5541	(108)
Total												37.3714	(109)
Fabric Energy Efficiency (DFEE)												37.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	93.0700	(1b)	x 2.5500	(2b) =	237.3285	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		237.3285	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											30.0000 / (5) =	0.1264	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000	(17)
Infiltration rate												0.3764	(18)
Number of sides sheltered												2	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3199	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4079	0.3999	0.3919	0.3519	0.3439	0.3039	0.3039	0.2960	0.3199	0.3439	0.3599	0.3759	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5832	0.5800	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5512	0.5591	0.5648	0.5707	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			19.0800	1.1450	21.8473			(27)
Ground Floor			93.0700	0.1300	12.0991			(28a)
Brickwork	87.2700	19.0800	68.1900	0.1800	12.2742			(29a)
Communal Wall	13.9000	2.0600	11.8400	0.1800	2.1312			(29a)
Total net area of external elements Aum(A, m2)			194.2400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.4118			(33)
Main dwelling								
Party Wall 1			15.9400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	268.7518	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.1800	0.0700	2.6726
E16 Corner (normal)	15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770
P1 Party wall - Ground floor	6.0300	0.0800	0.4824
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.7200	0.0500	0.4360
E4 Jamb	33.7900	0.0500	1.6895
E5 Ground floor (normal)	38.1800	0.1600	6.1088
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.5143	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	62.9261	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.6756	45.4226	45.1745	44.0095	43.7916	42.7769	42.7769	42.5890	43.1678	43.7916	44.2325	44.6935	(38)
Heat transfer coeff	108.6017	108.3487	108.1007	106.9357	106.7177	105.7030	105.7030	105.5151	106.0939	106.7177	107.1586	107.6196	(39)
Average = Sum(39)m / 12 =												106.9346	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1669	1.1642	1.1615	1.1490	1.1466	1.1357	1.1357	1.1337	1.1399	1.1466	1.1514	1.1563	(40)
HLP (average)												1.1490	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6655	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	29.7571	29.3151	28.6928	27.5453	26.6861	25.7334	25.2187	25.8367	26.5096	27.5291	28.7002	29.6565	(42b)

Hot water usage for other uses

	41.9269	40.4023	38.8777	37.3531	35.8284	34.3038	34.3038	35.8284	37.3531	38.8777	40.4023	41.9269	(42c)
Average daily hot water use (litres/day)												65.7049	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.6840	69.7174	67.5705	64.8984	62.5145	60.0372	59.5226	61.6652	63.8627	66.4067	69.1025	71.5834	(44)
Energy conte	113.5299	99.2767	103.8533	88.8426	84.1566	73.8227	71.9874	76.3544	78.7490	90.1133	98.4491	112.0823	(45)
Energy content (annual)										Total = Sum(45)m =		1091.2173	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	96.5004	84.3852	88.2753	75.5162	71.5331	62.7493	61.1893	64.9012	66.9367	76.5963	83.6817	95.2699	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	96.5004	84.3852	88.2753	75.5162	71.5331	62.7493	61.1893	64.9012	66.9367	76.5963	83.6817	95.2699	(64)
										Total per year (kWh/year) = Sum(64)m =		927.5347	(64)
12Total per year (kWh/year)												928	(64)
Electric shower(s)	55.1859	49.1711	53.6930	51.2386	52.2000	49.7938	51.4536	52.2000	51.2386	53.6930	52.6834	55.1859	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		627.7369	(64a)
Heat gains from water heating, kWh/month	37.9216	33.3891	35.4921	31.6887	30.9333	28.1358	28.1607	29.2753	29.5438	32.5723	34.0913	37.6140	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	123.9536	137.2343	123.9536	128.0854	123.9536	128.0854	123.9536	123.9536	128.0854	123.9536	128.0854	123.9536	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	244.6137	247.1521	240.7556	227.1382	209.9487	193.7930	183.0000	180.4616	186.8581	200.4755	217.6650	233.8207	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	(71)

Water heating gains (Table 5)

	50.9699	49.6861	47.7044	44.0121	41.5770	39.0775	37.8504	39.3485	41.0331	43.7800	47.3490	50.5564	(72)

Total internal gains

	482.5190	497.0543	475.3953	462.2174	438.4610	423.9376	407.7857	406.7455	418.9584	431.1909	456.0812	471.3125	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.0600	19.6403	0.6300	0.7000	0.7700	30.3717	(76)
Southeast	7.0100	36.7938	0.6300	0.7000	0.7700	78.8252	(77)
South	2.5300	46.7521	0.6300	0.7000	0.7700	36.1487	(78)
West	4.4800	19.6403	0.6300	0.7000	0.7700	26.8904	(80)

Solar gains	172.2360	305.4876	443.6010	581.9083	673.5079	676.1286	648.8948	580.7771	492.2522	345.1679	208.6621	145.7833	(83)
Total gains	654.7550	802.5419	918.9963	1044.1257	1111.9689	1100.0662	1056.6805	987.5227	911.2106	776.3588	664.7433	617.0958	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.9767	64.1261	64.2732	64.9735	65.1062	65.7311	65.7311	65.8482	65.4890	65.1062	64.8383	64.5605	
alpha	5.2651	5.2751	5.2849	5.3316	5.3404	5.3821	5.3821	5.3899	5.3659	5.3404	5.3226	5.3040	
util living area													
	0.9970	0.9909	0.9745	0.9172	0.7908	0.5969	0.4372	0.4860	0.7385	0.9503	0.9924	0.9978	(86)
MIT	19.7414	19.9705	20.2709	20.6343	20.8769	20.9783	20.9966	20.9941	20.9356	20.5952	20.0979	19.7050	(87)
Th 2	19.9466	19.9488	19.9509	19.9610	19.9629	19.9718	19.9718	19.9734	19.9684	19.9629	19.9591	19.9551	(88)
util rest of house													
	0.9959	0.9878	0.9655	0.8896	0.7312	0.5089	0.3366	0.3805	0.6525	0.9274	0.9892	0.9970	(89)
MIT 2	18.8113	19.0401	19.3359	19.6848	19.8882	19.9631	19.9710	19.9720	19.9378	19.6592	19.1760	18.7817	(90)
Living area fraction									fLA = Living area / (4) =			0.3723	(91)
MIT	19.1576	19.3865	19.6840	20.0383	20.2563	20.3411	20.3528	20.3525	20.3093	20.0076	19.5192	19.1255	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1576	19.3865	19.6840	20.0383	20.2563	20.3411	20.3528	20.3525	20.3093	20.0076	19.5192	19.1255	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9948	0.9856	0.9627	0.8919	0.7493	0.5413	0.3742	0.4200	0.6827	0.9286	0.9874	0.9961	(94)
Useful gains	651.3730	790.9733	884.7092	931.2511	833.1741	595.5192	395.4118	414.7270	622.1092	720.9041	656.3697	614.7124	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1613.5596	1569.5891	1425.1979	1191.0813	913.1086	606.8473	396.6847	417.0491	658.7680	1003.9615	1330.8276	1606.2746	(97)
Space heating kWh													
	715.8669	523.2298	402.1236	187.0777	59.4713	0.0000	0.0000	0.0000	0.0000	210.5948	485.6097	737.7222	(98a)
Space heating requirement - total per year (kWh/year)												3321.6959	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	715.8669	523.2298	402.1236	187.0777	59.4713	0.0000	0.0000	0.0000	0.0000	210.5948	485.6097	737.7222	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3321.6959	
Space heating per m2											(98c) / (4) =	35.6903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	993.6086	782.2025	801.9151	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9195	0.9613	0.9449	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	913.6375	751.9286	757.7611	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1236.4136	1188.1192	1109.7246	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	232.3988	324.5259	261.8608	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	58.0997	81.1315	65.4652	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												204.6964	(107)
Energy for space heating												35.6903	(99)
Energy for space cooling												2.1994	(108)
Total												37.8897	(109)
Fabric Energy Efficiency (TFEE)												37.9	(109)

Full SAP Calculation Printout

Plot Reference	P-22	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-22
Plot Address	Flat 2, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	80 C	**DER**	4.90	**TER**	12.43
Environmental	96 A	**% DER < TER**			60.58
CO_2 Emissions (t/year)	0.37	**DFEE**	37.37	**TFEE**	37.89
Compliance Check	See BREL	**% DFEE < TFEE**			1.37
% DPER < TPER	23.08	**DPER**	50.50	**TPER**	65.65

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	93.0700 (1b)	x	2.5500 (2b)	=	237.3285	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.3285	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5600	(17)
Infiltration rate		0.1280	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1088	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1387	0.1360	0.1333	0.1197	0.1170	0.1034	0.1034	0.1006	0.1088	0.1170	0.1224	0.1278	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000	(23c)
Effective ac	0.2787	0.2760	0.2733	0.2597	0.2570	0.2434	0.2434	0.2406	0.2488	0.2570	0.2624	0.2678	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			4.8800	1.1450	5.1298			(27)
Window-Red			14.6000	1.2357	18.0418			(27)
Ground Floor			93.0700	0.1200	11.1684	110.0000	10237.7000	(28a)
Brickwork	87.2700	19.0800	68.1900	0.2100	14.3199	110.0000	7500.8996	(29a)
Communal Wall	13.9000	2.0600	11.8400	0.2200	2.6048	110.0000	1302.4000	(29a)
Total net area of external elements Aum(A, m2)			194.2400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.7367			(33)
Main dwelling								
Party Wall 1			15.9400	0.0000	0.0000	110.0000	1753.4000	(32)
Party Ceiling 1			93.0700			30.0000	2792.1000	(32b)
Internal Wall 1			158.4700			9.0000	1426.2300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		25012.7296	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							268.7518	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.1800	0.0380	1.4508
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0970	-0.5141
P1 Party wall - Ground floor	6.0300	0.1080	0.6512
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.7200	0.0500	0.4360
E4 Jamb	33.7900	0.0160	0.5406
E5 Ground floor (normal)	38.1800	0.1120	4.2762
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.7877 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.5244 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.8289	21.6159	21.4029	20.3377	20.1247	19.0596	19.0596	18.8465	19.4856	20.1247	20.5507	20.9768	(38)
Heat transfer coeff	83.3533	83.1403	82.9273	81.8621	81.6491	80.5840	80.5840	80.3710	81.0100	81.6491	82.0752	82.5012	(39)

Average = Sum(39)m / 12 = 81.8089

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8956	0.8933	0.8910	0.8796	0.8773	0.8658	0.8658	0.8636	0.8704	0.8773	0.8819	0.8864	(40)
HLP (average)												0.8790	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6655 (42)

Hot water usage for mixer showers

68.9107	67.8751	66.3660	63.4787	61.3479	58.9717	57.6211	59.1187	60.7604	63.3117	66.2611	68.6466	(42a)

Hot water usage for baths

29.7571	29.3151	28.6928	27.5453	26.6861	25.7334	25.2187	25.8367	26.5096	27.5291	28.7002	29.6565	(42b)

Hot water usage for other uses

41.9269	40.4023	38.8777	37.3531	35.8284	34.3038	34.3038	35.8284	37.3531	38.8777	40.4023	41.9269	(42c)

Average daily hot water use (litres/day) 129.2382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5946	137.5925	133.9365	128.3771	123.8625	119.0089	117.1436	120.7839	124.6230	129.7185	135.3635	140.2300	(44)
Energy conte	222.6675	195.9298	205.8554	175.7418	166.7427	146.3353	141.6751	149.5557	153.6727	176.0267	192.8501	219.5663	(45)

Energy content (annual) Total = Sum(45)m = 2146.6190

Distribution loss (46)m = 0.15 x (45)m

33.4001	29.3895	30.8783	26.3613	25.0114	21.9503	21.2513	22.4333	23.0509	26.4040	28.9275	32.9349	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)

Total per year (kWh/year) = Sum(64)m = 2491.5440 (64)

12Total per year (kWh/year) 2492 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

74.0369	65.1467	68.4469	58.4341	55.4419	48.6565	47.1070	49.7273	51.0962	58.5289	64.1227	73.0058	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.9536	137.2343	123.9536	128.0854	123.9536	128.0854	123.9536	123.9536	128.0854	123.9536	128.0854	123.9536	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.6137	247.1521	240.7556	227.1382	209.9487	193.7930	183.0000	180.4616	186.8581	200.4755	217.6650	233.8207	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	(71)
Water heating gains (Table 5)	99.5120	96.9445	91.9985	81.1585	74.5187	67.5785	63.3158	66.8377	70.9669	78.6679	89.0593	98.1261	(72)
Total internal gains	531.0611	544.3126	519.6895	499.3639	471.4028	452.4386	433.2511	434.2347	448.8922	466.0787	497.7914	518.8822	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.4800	19.6403	0.3300	0.0000	0.7700	22.3578	(80)
East	5.0600	19.6403	0.3100	0.0000	0.7700	23.7219	(76)
Southeast	7.0100	36.7938	0.3100	0.0000	0.7700	61.5666	(77)
South	2.5300	46.7521	0.3100	0.0000	0.7700	28.2341	(78)

Solar gains	135.8805	241.2528	350.8413	460.8679	533.8480	536.0797	514.4255	460.1497	389.5522	272.7398	164.6657	114.9788	(83)
Total gains	666.9416	785.5654	870.5308	960.2318	1005.2508	988.5182	947.6766	894.3844	838.4444	738.8185	662.4572	633.8610	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.3558	83.5693	83.7840	84.8742	85.0956	86.2204	86.2204	86.4489	85.7669	85.0956	84.6539	84.2167	
alpha	6.5571	6.5713	6.5856	6.6583	6.6730	6.7480	6.7480	6.7633	6.7178	6.6730	6.6436	6.6144	
util living area	0.9958	0.9873	0.9640	0.8825	0.7232	0.5186	0.3738	0.4127	0.6514	0.9218	0.9885	0.9969	(86)
MIT	20.1724	20.3596	20.5866	20.8368	20.9631	20.9965	20.9997	20.9994	20.9854	20.8082	20.4460	20.1411	(87)
Th 2	20.1712	20.1732	20.1751	20.1849	20.1868	20.1966	20.1966	20.1986	20.1927	20.1868	20.1829	20.1790	(88)
util rest of house	0.9944	0.9833	0.9529	0.8520	0.6703	0.4550	0.3058	0.3412	0.5817	0.8934	0.9841	0.9959	(89)
MIT 2	19.2087	19.4472	19.7305	20.0303	20.1589	20.1948	20.1965	20.1984	20.1841	20.0072	19.5659	19.1750	(90)
Living area fraction									fLA = Living area / (4) =			0.3723	(91)
MIT	19.5675	19.7869	20.0493	20.3305	20.4583	20.4933	20.4955	20.4966	20.4824	20.3054	19.8936	19.5347	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5675	19.7869	20.0493	20.3305	20.4583	20.4933	20.4955	20.4966	20.4824	20.3054	19.8936	19.5347	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9810	0.9510	0.8579	0.6885	0.4786	0.3311	0.3679	0.6073	0.8981	0.9822	0.9948	(94)
Useful gains	662.3178	770.6180	827.8506	823.7981	692.1578	473.1449	313.7967	329.0054	509.1476	663.4974	650.6451	630.5720	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1272.5951	1237.7021	1123.6027	935.7287	715.1096	474.9041	313.9181	329.2470	517.0406	792.4397	1050.0355	1265.1290	(97)
Space heating kWh	454.0463	313.8805	220.0396	80.5900	17.0761	0.0000	0.0000	0.0000	0.0000	95.9330	287.5611	472.1104	(98a)
Space heating requirement - total per year (kWh/year)												1941.2370	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	454.0463	313.8805	220.0396	80.5900	17.0761	0.0000	0.0000	0.0000	0.0000	95.9330	287.5611	472.1104	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1941.2370	
Space heating per m2										(98c) / (4) =		20.8578	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	454.0463	313.8805	220.0396	80.5900	17.0761	0.0000	0.0000	0.0000	0.0000	95.9330	287.5611	472.1104	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	454.0463	313.8805	220.0396	80.5900	17.0761	0.0000	0.0000	0.0000	0.0000	95.9330	287.5611	472.1104	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.6674	61.4906	65.0188	56.4312	54.2042	48.3003	47.2730	49.4520	50.3291	56.7712	61.1616	68.8099	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.0621	13.6044	15.0621	14.5762	15.0621	14.5762	15.0621	15.0621	14.5762	15.0621	14.5762	15.0621	(231)
Lighting	25.2287	20.2394	18.2233	13.3512	10.3128	8.4257	9.4077	12.2285	15.8836	20.8402	23.5389	25.9299	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1941.2370	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	688.9094	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	177.3437	(230a)
Total electricity for the above, kWh/year	177.3437	(231)
Electricity for lighting (calculated in Appendix L)	203.6099	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3011.1000	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1941.2370	0.1572	305.0975	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	688.9094	0.1412	97.2612	(264)
Space and water heating			402.3587	(265)
Pumps, fans and electric keep-hot	177.3437	0.1387	24.5998	(267)
Energy for lighting	203.6099	0.1443	29.3872	(268)
Total CO2, kg/year			456.3457	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.9000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1941.2370	1.5818	3070.6793	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	688.9094	1.5221	1048.5556	(278)
Space and water heating			4119.2349	(279)
Pumps, fans and electric keep-hot	177.3437	1.5128	268.2856	(281)
Energy for lighting	203.6099	1.5338	312.3037	(282)
Total Primary energy kWh/year			4699.8242	(286)
Dwelling Primary energy Rate (DPER)			50.5000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	93.0700 (1b)	x	2.5500 (2b)	=	237.3285 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 93.0700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.3285	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1264	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3764	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3199	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4079	0.3999	0.3919	0.3519	0.3439	0.3039	0.3039	0.2960	0.3199	0.3439	0.3599	0.3759	(22b)
Effective ac	0.5832	0.5800	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5512	0.5591	0.5648	0.5707	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			19.0800	1.1450	21.8473			(27)
Ground Floor			93.0700	0.1300	12.0991			(28a)
Brickwork	87.2700	19.0800	68.1900	0.1800	12.2742			(29a)
Communal Wall	13.9000	2.0600	11.8400	0.1800	2.1312			(29a)
Total net area of external elements Aum(A, m2)			194.2400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.4118			(33)
Main dwelling								
Party Wall 1			15.9400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 268.7518 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.1800	0.0700	2.6726
E16 Corner (normal)	15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770
P1 Party wall - Ground floor	6.0300	0.0800	0.4824
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.7200	0.0500	0.4360
E4 Jamb	33.7900	0.0500	1.6895
E5 Ground floor (normal)	38.1800	0.1600	6.1088
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.5143 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 62.9261 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.6756	45.4226	45.1745	44.0095	43.7916	42.7769	42.7769	42.5890	43.1678	43.7916	44.2325	44.6935	(38)
Heat transfer coeff	108.6017	108.3487	108.1007	106.9357	106.7177	105.7030	105.7030	105.5151	106.0939	106.7177	107.1586	107.6196	(39)

Average = Sum(39)m / 12 = 106.9346

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1669	1.1642	1.1615	1.1490	1.1466	1.1357	1.1357	1.1337	1.1399	1.1466	1.1514	1.1563	(40)
HLP (average)												1.1490	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6655 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.9107	67.8751	66.3660	63.4787	61.3479	58.9717	57.6211	59.1187	60.7604	63.3117	66.2611	68.6466	(42a)
Hot water usage for baths	29.7571	29.3151	28.6928	27.5453	26.6861	25.7334	25.2187	25.8367	26.5096	27.5291	28.7002	29.6565	(42b)
Hot water usage for other uses	41.9269	40.4023	38.8777	37.3531	35.8284	34.3038	34.3038	35.8284	37.3531	38.8777	40.4023	41.9269	(42c)

Average daily hot water use (litres/day) 129.2382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5946	137.5925	133.9365	128.3771	123.8625	119.0089	117.1436	120.7839	124.6230	129.7185	135.3635	140.2300	(44)
Energy conte	222.6675	195.9298	205.8554	175.7418	166.7427	146.3353	141.6751	149.5557	153.6727	176.0267	192.8501	219.5663	(45)
Energy content (annual)										Total = Sum(45)m =		2146.6190	
Distribution loss (46)m = 0.15 x (45)m	33.4001	29.3895	30.8783	26.3613	25.0114	21.9503	21.2513	22.4333	23.0509	26.4040	28.9275	32.9349	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	269.2624	238.0156	252.4503	220.8336	213.3376	191.4272	188.2700	196.1506	198.7645	222.6216	237.9420	266.1612	(62)
WWHRS	-31.5031	-27.8616	-29.1750	-24.1581	-22.5145	-19.2658	-18.0586	-19.2035	-19.9331	-23.4990	-26.6215	-30.9197	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	237.7593	210.1540	223.2752	196.6755	190.8231	172.1614	170.2114	176.9470	178.8314	199.1227	211.3205	235.2415	(64)
										Total per year (kWh/year) = Sum(64)m =		2402.5230	(64)
12Total per year (kWh/year)												2403	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3129	98.8152	105.7228	94.5076	92.7179	84.7300	84.3829	87.0032	87.1696	95.8048	100.1961	110.2817	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	133.2727	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.9536	137.2343	123.9536	128.0854	123.9536	128.0854	123.9536	123.9536	128.0854	123.9536	128.0854	123.9536	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.6137	247.1521	240.7556	227.1382	209.9487	193.7930	183.0000	180.4616	186.8581	200.4755	217.6650	233.8207	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	36.3273	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	(71)
Water heating gains (Table 5)													
	149.6141	147.0465	142.1006	131.2606	124.6208	117.6805	113.4179	116.9398	121.0689	128.7699	139.1613	148.2281	(72)
Total internal gains													
	584.1632	597.4147	572.7915	552.4659	524.5048	502.5406	483.3532	484.3368	498.9942	519.1808	550.8935	571.9842	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.0600	19.6403	0.6300	0.7000	0.7700	30.3717	(76)
Southeast	7.0100	36.7938	0.6300	0.7000	0.7700	78.8252	(77)
South	2.5300	46.7521	0.6300	0.7000	0.7700	36.1487	(78)
West	4.4800	19.6403	0.6300	0.7000	0.7700	26.8904	(80)

Solar gains	172.2360	305.4876	443.6010	581.9083	673.5079	676.1286	648.8948	580.7771	492.2522	345.1679	208.6621	145.7833	(83)
Total gains	756.3992	902.9023	1016.3925	1134.3742	1198.0127	1178.6693	1132.2479	1065.1139	991.2464	864.3487	759.5556	717.7675	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.9767	64.1261	64.2732	64.9735	65.1062	65.7311	65.7311	65.8482	65.4890	65.1062	64.8383	64.5605	
alpha	5.2651	5.2751	5.2849	5.3316	5.3404	5.3821	5.3821	5.3899	5.3659	5.3404	5.3226	5.3040	
util living area													
	0.9941	0.9848	0.9619	0.8919	0.7538	0.5613	0.4087	0.4521	0.6941	0.9268	0.9862	0.9955	(86)
MIT	19.8490	20.0724	20.3599	20.6931	20.9027	20.9837	20.9975	20.9958	20.9520	20.6641	20.1951	19.8123	(87)
Th 2	19.9466	19.9488	19.9509	19.9610	19.9629	19.9718	19.9718	19.9734	19.9684	19.9629	19.9591	19.9551	(88)
util rest of house													
	0.9921	0.9798	0.9493	0.8591	0.6919	0.4768	0.3143	0.3531	0.6078	0.8965	0.9807	0.9939	(89)
MIT 2	18.6266	18.9106	19.2697	19.6704	19.8891	19.9636	19.9711	19.9721	19.9402	19.6498	19.0760	18.5863	(90)
Living area fraction									fLA = Living area / (4) =			0.3723	(91)
MIT	19.0817	19.3431	19.6756	20.0512	20.2665	20.3434	20.3532	20.3532	20.3169	20.0274	19.4927	19.0427	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0817	19.3431	19.6756	20.0512	20.2665	20.3434	20.3532	20.3532	20.3169	20.0274	19.4927	19.0427	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9898	0.9760	0.9453	0.8623	0.7111	0.5079	0.3496	0.3901	0.6384	0.8987	0.9775	0.9920	(94)
Useful gains	748.7207	881.2211	960.7923	978.1776	851.8542	598.6888	395.8134	415.5008	632.7714	776.7950	742.4356	712.0535	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1605.3179	1564.8941	1424.2934	1192.4573	914.1938	607.0931	396.7263	417.1270	659.5767	1006.0704	1327.9819	1597.3700	(97)
Space heating kWh													
	637.3083	459.4283	344.8448	154.2814	46.3806	0.0000	0.0000	0.0000	0.0000	170.5809	421.5933	658.6754	(98a)
Space heating requirement - total per year (kWh/year)												2893.0931	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	637.3083	459.4283	344.8448	154.2814	46.3806	0.0000	0.0000	0.0000	0.0000	170.5809	421.5933	658.6754	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2893.0931	
Space heating per m2											(98c) / (4) =	31.0851	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	637.3083	459.4283	344.8448	154.2814	46.3806	0.0000	0.0000	0.0000	0.0000	170.5809	421.5933	658.6754	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	690.4748	497.7555	373.6130	167.1521	50.2499	0.0000	0.0000	0.0000	0.0000	184.8114	456.7642	713.6245	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	237.7593	210.1540	223.2752	196.6755	190.8231	172.1614	170.2114	176.9470	178.8314	199.1227	211.3205	235.2415	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1598	85.7642	85.0311	83.5212	81.4134	79.8000	79.8000	79.8000	79.8000	83.7148	85.5775	86.2404	(217)
Fuel for water heating, kWh/month													
	275.9517	245.0371	262.5807	235.4797	234.3879	215.7411	213.2975	221.7382	224.0995	237.8584	246.9347	272.7740	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.7551	20.6617	18.6036	13.6298	10.5280	8.6015	9.6040	12.4837	16.2151	21.2750	24.0301	26.4709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.6011	-36.2687	-54.4832	-64.1013	-71.5907	-67.7036	-66.8546	-61.8782	-53.5473	-42.6979	-27.5963	-21.0866	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.4671	-20.2957	-41.0622	-62.7538	-84.0536	-84.8692	-83.8929	-70.5553	-51.0770	-29.4006	-12.7579	-7.4599	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3134.4454	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2885.8803	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	207.8584	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1150.0545	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5164.1297	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3134.4454	0.2100	658.2335	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2885.8803	0.2100	606.0349	(264)
Space and water heating			1264.2684	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	207.8584	0.1443	30.0004	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-592.4094	0.1337	-79.1848	
PV Unit electricity exported	-557.6450	0.1254	-69.9192	
Total			-149.1040	(269)
Total CO2, kg/year			1157.0940	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3134.4454	1.1300	3541.9233	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2885.8803	1.1300	3261.0448	(278)
Space and water heating			6802.9681	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	207.8584	1.5338	318.8202	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-592.4094	1.4940	-885.0323	
PV Unit electricity exported	-557.6450	0.4602	-256.6376	
Total			-1141.6699	(283)
Total Primary energy kWh/year			6110.2193	(286)
Target Primary Energy Rate (TPER)			65.6500	(287)

Full SAP Calculation Printout

Plot Reference	P-22	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-22
Plot Address	Flat 2, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	80 C	**DER**	4.90	**TER**	12.43
Environmental	96 A	**% DER < TER**			60.58
CO_2 Emissions (t/year)	0.37	**DFEE**	37.37	**TFEE**	37.89
Compliance Check	See BREL	**% DFEE < TFEE**			1.37
% DPER < TPER	23.08	**DPER**	50.50	**TPER**	65.65

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	93.0700	(1b)	x 2.5500	(2b) =	237.3285	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0700					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.3285	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5600 (17)
Infiltration rate		0.1280 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1088 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1387	0.1360	0.1333	0.1197	0.1170	0.1034	0.1034	0.1006	0.1088	0.1170	0.1224	0.1278	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000	(23c)
Effective ac	0.2787	0.2760	0.2733	0.2597	0.2570	0.2434	0.2434	0.2406	0.2488	0.2570	0.2624	0.2678	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			4.8000	1.1450	5.1298			(27)
Window-Red			14.6000	1.2357	18.0418			(27)
Ground Floor			93.0700	0.1200	11.1684	110.0000	10237.7000	(28a)
Brickwork	87.2700	19.0800	68.1900	0.2100	14.3199	110.0000	7500.8996	(29a)
Communal Wall	13.9000	2.0600	11.8400	0.2200	2.6048	110.0000	1302.4000	(29a)
Total net area of external elements Aum(A, m2)			194.2400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.7367			(33)
Main dwelling								
Party Wall 1			15.9400	0.0000	0.0000	110.0000	1753.4000	(32)
Party Ceiling 1			93.0700			30.0000	2792.1000	(32b)
Internal Wall 1			158.4700			9.0000	1426.2300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		25012.7296	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							268.7518	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	38.1800	0.0380	1.4508
E16	Corner (normal)	15.9000	0.0540	0.8586
E17	Corner (inverted - internal area greater than external area)	5.3000	-0.0970	-0.5141
P1	Party wall - Ground floor	6.0300	0.1080	0.6512
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2	Other lintels (including other steel lintels)	8.7200	0.0500	0.4360
E4	Jamb	33.7900	0.0160	0.5406
E5	Ground floor (normal)	38.1800	0.1120	4.2762
E25	Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.7877 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.5244 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.8289	21.6159	21.4029	20.3377	20.1247	19.0596	19.0596	18.8465	19.4856	20.1247	20.5507	20.9768	(38)
Heat transfer coeff	83.3533	83.1403	82.9273	81.8621	81.6491	80.5840	80.5840	80.3710	81.0100	81.6491	82.0752	82.5012	(39)

Average = Sum(39)m / 12 = 81.8089

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8956	0.8933	0.8910	0.8796	0.8773	0.8658	0.8658	0.8636	0.8704	0.8773	0.8819	0.8864	(40)
HLP (average)												0.8790	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6655 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.9107	67.8751	66.3660	63.4787	61.3479	58.9717	57.6211	59.1187	60.7604	63.3117	66.2611	68.6466	(42a)
Hot water usage for baths	29.7571	29.3151	28.6928	27.5453	26.6861	25.7334	25.2187	25.8367	26.5096	27.5291	28.7002	29.6565	(42b)
Hot water usage for other uses	41.9269	40.4023	38.8777	37.3531	35.8284	34.3038	34.3038	35.8284	37.3531	38.8777	40.4023	41.9269	(42c)

Average daily hot water use (litres/day) 129.2382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5946	137.5925	133.9365	128.3771	123.8625	119.0089	117.1436	120.7839	124.6230	129.7185	135.3635	140.2300	(44)
Energy conte	222.6675	195.9298	205.8554	175.7418	166.7427	146.3353	141.6751	149.5557	153.6727	176.0267	192.8501	219.5663	(45)

Energy content (annual) Total = Sum(45)m = 2146.6190

Distribution loss (46)m = 0.15 x (45)m	33.4001	29.3895	30.8783	26.3613	25.0114	21.9503	21.2513	22.4333	23.0509	26.4040	28.9275	32.9349	(46)

Water storage loss (or HIU loss):

Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)

Total per year (kWh/year) = Sum(64)m = 2491.5440 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	74.0369	65.1467	68.4469	58.4341	55.4419	48.6565	47.1070	49.7273	51.0962	58.5289	64.1227	73.0058	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.8231	25.6004	20.8197	15.7618	11.7821	9.9470	10.7481	13.9707	18.7515	23.8093	27.7890	29.6242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.0951	368.8837	359.3367	339.0122	313.3562	289.2432	273.1343	269.3457	278.8927	299.2172	324.8732	348.9862	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	(71)
Water heating gains (Table 5)	99.5120	96.9445	91.9985	81.1585	74.5187	67.5785	63.3158	66.8377	70.9669	78.6679	89.0593	98.1261	(72)
Total internal gains	600.3975	598.3958	579.1221	542.8998	506.6243	473.7359	454.1654	457.1214	475.5784	508.6616	548.6887	583.7036	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.4800	19.6403	0.3300	0.0000	0.7700	22.3578	(80)
East	5.0600	19.6403	0.3100	0.0000	0.7700	23.7219	(76)
Southeast	7.0100	36.7938	0.3100	0.0000	0.7700	61.5666	(77)
South	2.5300	46.7521	0.3100	0.0000	0.7700	28.2341	(78)

Solar gains	135.8805	241.2528	350.8413	460.8679	533.8480	536.0797	514.4255	460.1497	389.5522	272.7398	164.6657	114.9788	(83)
Total gains	736.2780	839.6486	929.9634	1003.7677	1040.4723	1009.8156	968.5909	917.2711	865.1306	781.4014	713.3544	698.6825	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.3558	83.5693	83.7840	84.8742	85.0956	86.2204	86.2204	86.4489	85.7669	85.0956	84.6539	84.2167	
alpha	6.5571	6.5713	6.5856	6.6583	6.6730	6.7480	6.7480	6.7633	6.7178	6.6730	6.6436	6.6144	
util living area	0.9927	0.9821	0.9514	0.8636	0.7033	0.5080	0.3658	0.4025	0.6335	0.9029	0.9830	0.9946	(86)
MIT	20.2483	20.4154	20.6384	20.8589	20.9686	20.9969	20.9997	20.9995	20.9876	20.8361	20.4989	20.2129	(87)
Th 2	20.1712	20.1732	20.1751	20.1849	20.1868	20.1966	20.1966	20.1986	20.1927	20.1868	20.1829	20.1790	(88)
util rest of house	0.9904	0.9766	0.9374	0.8307	0.6505	0.4455	0.2992	0.3327	0.5648	0.8704	0.9768	0.9929	(89)
MIT 2	19.3050	19.5166	19.7921	20.0532	20.1633	20.1950	20.1965	20.1984	20.1855	20.0366	19.6316	19.2663	(90)
Living area fraction										fLA = Living area / (4) =		0.3723	(91)
MIT	19.6562	19.8512	20.1072	20.3532	20.4631	20.4936	20.4956	20.4966	20.4841	20.3343	19.9545	19.6187	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6562	19.8512	20.1072	20.3532	20.4631	20.4936	20.4956	20.4966	20.4841	20.3343	19.9545	19.6187	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9885	0.9740	0.9361	0.8379	0.6690	0.4688	0.3240	0.3587	0.5901	0.8769	0.9747	0.9913	(94)
Useful gains	727.8225	817.8455	870.4957	841.1071	696.0333	473.3742	313.8141	329.0446	510.4867	685.2458	695.2873	692.6360	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1279.9877	1243.0504	1128.4067	937.5815	715.5013	474.9271	313.9200	329.2512	517.1747	794.7967	1055.0317	1272.0606	(97)
Space heating kWh	410.8109	285.7377	191.8857	69.4616	14.4842	0.0000	0.0000	0.0000	0.0000	81.5058	259.0159	431.0919	(98a)
Space heating requirement - total per year (kWh/year)												1743.9938	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	410.8109	285.7377	191.8857	69.4616	14.4842	0.0000	0.0000	0.0000	0.0000	81.5058	259.0159	431.0919	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1743.9938	
Space heating per m2											(98c) / (4) =	18.7385	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	410.8109	285.7377	191.8857	69.4616	14.4842	0.0000	0.0000	0.0000	0.0000	81.5058	259.0159	431.0919	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	410.8109	285.7377	191.8857	69.4616	14.4842	0.0000	0.0000	0.0000	0.0000	81.5058	259.0159	431.0919	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	69.6674	61.4906	65.0188	56.4312	54.2042	48.3003	47.2730	49.4520	50.3291	56.7712	61.1616	68.8099	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.0621	13.6044	15.0621	14.5762	15.0621	14.5762	15.0621	15.0621	14.5762	15.0621	14.5762	15.0621	(231)
Lighting	25.2287	20.2394	18.2233	13.3512	10.3128	8.4257	9.4077	12.2285	15.8836	20.8402	23.5389	25.9299	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1743.9938	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												688.9094	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	177.3437	(230a)
Total electricity for the above, kWh/year	177.3437	(231)
Electricity for lighting (calculated in Appendix L)	203.6099	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2813.8568	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1743.9938	16.4900	287.5846	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	688.9094	16.4900	113.6012	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	177.3437	16.4900	29.2440	(249)
Energy for lighting	203.6099	16.4900	33.5753	(250)
Additional standing charges			0.0000	(251)
Total energy cost			464.0050	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2098	(257)
SAP value		80.3886	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1743.9938	0.1573	274.3478	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	688.9094	0.1412	97.2612	(264)
Space and water heating			371.6090	(265)
Pumps, fans and electric keep-hot	177.3437	0.1387	24.5998	(267)
Energy for lighting	203.6099	0.1443	29.3872	(268)
Total CO2, kg/year			425.5960	(272)
CO2 emissions per m2			4.5700	(273)
EI value			95.8695	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	93.0700	(1b) x	2.5500	(2b) =	237.3285	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 93.0700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.3285	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50												2.5600	(17)
Infiltration rate												0.1280	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1088	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1170	0.1115	0.1115	0.1034	0.1061	0.0925	0.0925	0.0898	0.0925	0.1034	0.1006	0.1088	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2570	0.2515	0.2515	0.2434	0.2461	0.2325	0.2325	0.2298	0.2325	0.2434	0.2406	0.2488	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			4.4800	1.1450	5.1298			(27)
Window-Red			14.6000	1.2357	18.0418			(27)
Ground Floor			93.0700	0.1200	11.1684	110.0000	10237.7000	(28a)
Brickwork	87.2700	19.0800	68.1900	0.2100	14.3199	110.0000	7500.8996	(29a)
Communal Wall	13.9000	2.0600	11.8400	0.2200	2.6048	110.0000	1302.4000	(29a)
Total net area of external elements Aum(A, m2)			194.2400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.7367			(33)
Main dwelling								
Party Wall 1			15.9400	0.0000	0.0000	110.0000	1753.4000	(32)
Party Ceiling 1			93.0700			30.0000	2792.1000	(32b)
Internal Wall 1			158.4700			9.0000	1426.2300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 25012.7296	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	268.7518	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.1800	0.0380	1.4508
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0970	-0.5141
P1 Party wall - Ground floor	6.0300	0.1080	0.6512
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.7200	0.0500	0.4360
E4 Jamb	33.7900	0.0160	0.5406
E5 Ground floor (normal)	38.1800	0.1120	4.2762
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.7877	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	61.5244	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.1247	19.6986	19.6986	19.0596	19.2726	18.2075	18.2075	17.9944	18.2075	19.0596	18.8465	19.4856	(38)
Heat transfer coeff	81.6491	81.2231	81.2231	80.5840	80.7970	79.7319	79.7319	79.5189	79.7319	80.5840	80.3710	81.0100	(39)
Average = Sum(39)m / 12 =												80.5130	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8773	0.8727	0.8727	0.8658	0.8681	0.8567	0.8567	0.8544	0.8567	0.8658	0.8636	0.8704	(40)
HLP (average)												0.8651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6655	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.9107	67.8751	66.3660	63.4787	61.3479	58.9717	57.6211	59.1187	60.7604	63.3117	66.2611	68.6466	(42a)
Hot water usage for baths	29.7571	29.3151	28.6928	27.5453	26.6861	25.7334	25.2187	25.8367	26.5096	27.5291	28.7002	29.6565	(42b)
Hot water usage for other uses	41.9269	40.4023	38.8777	37.3531	35.8284	34.3038	34.3038	35.8284	37.3531	38.8777	40.4023	41.9269	(42c)
Average daily hot water use (litres/day)												129.2382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.5946	137.5925	133.9365	128.3771	123.8625	119.0089	117.1436	120.7839	124.6230	129.7185	135.3635	140.2300	(44)
Energy conte	222.6675	195.9298	205.8554	175.7418	166.7427	146.3353	141.6751	149.5557	153.6727	176.0267	192.8501	219.5663	(45)
Energy content (annual)											Total = Sum(45)m =	2146.6190	
Distribution loss (46)m = 0.15 x (45)m	33.4001	29.3895	30.8783	26.3613	25.0114	21.9503	21.2513	22.4333	23.0509	26.4040	28.9275	32.9349	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)
											Total per year (kWh/year) = Sum(64)m =	2491.5440	(64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	74.0369	65.1467	68.4469	58.4341	55.4419	48.6565	47.1070	49.7273	51.0962	58.5289	64.1227	73.0058 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	28.8231	25.6004	20.8197	15.7618	11.7821	9.9470	10.7481	13.9707	18.7515	23.8093	27.7890	29.6242	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	365.0951	368.8837	359.3367	339.0122	313.3562	289.2432	273.1343	269.3457	278.8927	299.2172	324.8732	348.9862	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	(71)

Water heating gains (Table 5)

	99.5120	96.9445	91.9985	81.1585	74.5187	67.5785	63.3158	66.8377	70.9669	78.6679	89.0593	98.1261	(72)

Total internal gains

	600.3975	598.3958	579.1221	542.8998	506.6243	473.7359	454.1654	457.1214	475.5784	508.6616	548.6887	583.7036	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.4800	23.8018	0.3300	0.0000	0.7700	27.0952	(80)
East	5.0600	23.8018	0.3100	0.0000	0.7700	28.7483	(76)
Southeast	7.0100	43.0593	0.3100	0.0000	0.7700	72.0505	(77)
South	2.5300	54.2217	0.3100	0.0000	0.7700	32.7451	(78)

Solar gains	160.6391	249.3544	360.6082	482.4844	546.2198	581.0674	551.7368	504.6745	427.3180	302.7078	191.7895	136.7063	(83)
Total gains	761.0366	847.7501	939.7303	1025.3842	1052.8441	1054.8033	1005.9021	961.7959	902.8963	811.3694	740.4781	720.4099	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.0956	85.5420	85.5420	86.2204	85.9930	87.1418	87.1418	87.3753	87.1418	86.2204	86.4489	85.7669	
alpha	6.6730	6.7028	6.7028	6.7480	6.7329	6.8095	6.8095	6.8250	6.8095	6.7480	6.7633	6.7178	
util living area	0.9881	0.9742	0.9291	0.8045	0.6118	0.3927	0.2616	0.2811	0.5265	0.8443	0.9695	0.9910	(86)
MIT	20.3768	20.5240	20.7356	20.9205	20.9882	20.9995	21.0000	21.0000	20.9966	20.9079	20.6261	20.3442	(87)
Th 2	20.1868	20.1908	20.1908	20.1966	20.1947	20.2045	20.2045	20.2064	20.2045	20.1966	20.1986	20.1927	(88)
util rest of house	0.9842	0.9663	0.9095	0.7633	0.5548	0.3328	0.1985	0.2155	0.4583	0.7992	0.9587	0.9880	(89)
MIT 2	19.4801	19.6665	19.9208	20.1276	20.1869	20.2043	20.2045	20.2064	20.2028	20.1198	19.8016	19.4439	(90)
Living area fraction									fLA = Living area / (4) =			0.3723	(91)
MIT	19.8140	19.9858	20.2242	20.4228	20.4852	20.5003	20.5006	20.5019	20.4983	20.4132	20.1085	19.7791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8140	19.9858	20.2242	20.4228	20.4852	20.5003	20.5006	20.5019	20.4983	20.4132	20.1085	19.7791	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9639	0.9104	0.7754	0.5756	0.3551	0.2220	0.2399	0.4837	0.8122	0.9572	0.9861	(94)
Useful gains	747.3690	817.1660	855.5129	795.1304	606.0587	374.5567	223.2939	230.7424	436.7397	659.0067	708.7895	710.4039	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1201.3818	1160.3355	1041.6192	847.9671	612.8645	374.7670	223.3000	230.7527	438.3921	718.2635	973.1753	1189.1558	(97)
Space heating kWh	337.7856	230.6099	138.4631	38.0424	5.0635	0.0000	0.0000	0.0000	0.0000	44.0871	190.3578	356.1914	(98a)

Space heating requirement - total per year (kWh/year) 1340.6008

Solar heating kWh

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	337.7856	230.6099	138.4631	38.0424	5.0635	0.0000	0.0000	0.0000	0.0000	44.0871	190.3578	356.1914	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1340.6008

Space heating per m2 (98c) / (4) = 14.4042 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	337.7856	230.6099	138.4631	38.0424	5.0635	0.0000	0.0000	0.0000	0.0000	44.0871	190.3578	356.1914	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)

337.7856	230.6099	138.4631	38.0424	5.0635	0.0000	0.0000	0.0000	0.0000	44.0871	190.3578	356.1914	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)

Efficiency of water heater 361.6650 (216)

(217)m 361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)

Fuel for water heating, kWh/month

69.6674	61.4906	65.0188	56.4312	54.2042	48.3003	47.2730	49.4520	50.3291	56.7712	61.1616	68.8099	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 15.0621	13.6044	15.0621	14.5762	15.0621	14.5762	15.0621	15.0621	14.5762	15.0621	14.5762	15.0621	(231)
Lighting 25.2287	20.2394	18.2233	13.3512	10.3128	8.4257	9.4077	12.2285	15.8836	20.8402	23.5389	25.9299	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	1340.6008	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	688.9094	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)

mechanical ventilation fans (SFP = 0.6125)	177.3437	(230a)
Total electricity for the above, kWh/year	177.3437	(231)
Electricity for lighting (calculated in Appendix L)	203.6099	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2410.4638	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1340.6008	27.6700	370.9443	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	688.9094	27.6700	190.6212	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	177.3437	27.6700	49.0710	(249)
Energy for lighting	203.6099	27.6700	56.3389	(250)
Additional standing charges			0.0000	(251)
Total energy cost			666.9753	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1340.6008	0.1582	212.0490	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	688.9094	0.1412	97.2612	(264)
Space and water heating			309.3102	(265)
Pumps, fans and electric keep-hot	177.3437	0.1387	24.5998	(267)
Energy for lighting	203.6099	0.1443	29.3872	(268)
Total CO2, kg/year			363.2972	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1340.6008	1.5855	2125.5541	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	688.9094	1.5221	1048.5556	(278)
Space and water heating			3174.1096	(279)
Pumps, fans and electric keep-hot	177.3437	1.5128	268.2856	(281)
Energy for lighting	203.6099	1.5338	312.3037	(282)
Total Primary energy kWh/year			3754.6989	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 80
Current environmental impact rating: A 96

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 80
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£667	£667	£0
Space heating	£420	£420	£0
Water heating	£191	£191	£0
Lighting	£56	£56	£0
Total cost of fuels	£667	£667	£0
Total cost of uses	£667	£667	£0
Delivered energy	26 kWh/m²	26 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	40 kWh/m²	40 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	93.0700 (1b)	x	2.5500 (2b)	=	237.3285	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0700					(4)
Dwelling volume					237.3285	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5600 (17)
Infiltration rate		0.1280 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1088 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1387	0.1360	0.1333	0.1197	0.1170	0.1034	0.1034	0.1006	0.1088	0.1170	0.1224	0.1278	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000 (23c)

Effective ac	0.2787	0.2760	0.2733	0.2597	0.2570	0.2434	0.2434	0.2406	0.2488	0.2570	0.2624	0.2678 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Window			4.4800	1.1450	5.1298			(27)
Window-Red			14.6000	1.2357	18.0418			(27)
Ground Floor			93.0700	0.1200	11.1684	110.0000	10237.7000	(28a)
Brickwork	87.2700	19.0800	68.1900	0.2100	14.3199	110.0000	7500.8996	(29a)
Communal Wall	13.9000	2.0600	11.8400	0.2200	2.6048	110.0000	1302.4000	(29a)
Total net area of external elements Aum(A, m2)			194.2400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7367			(33)
Main dwelling								
Party Wall 1			15.9400	0.0000	0.0000	110.0000	1753.4000	(32)
Party Ceiling 1			93.0700			30.0000	2792.1000	(32b)
Internal Wall 1			158.4700			9.0000	1426.2300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	25012.7296 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		268.7518 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.1800	0.0380	1.4508
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0970	-0.5141
P1 Party wall - Ground floor	6.0300	0.1080	0.6512
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.7200	0.0500	0.4360
E4 Jamb	33.7900	0.0160	0.5406
E5 Ground floor (normal)	38.1800	0.1120	4.2762
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.7877 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	61.5244 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.8289	21.6159	21.4029	20.3377	20.1247	19.0596	19.0596	18.8465	19.4856	20.1247	20.5507	20.9768	(38)
Heat transfer coeff	83.3533	83.1403	82.9273	81.8621	81.6491	80.5840	80.5840	80.3710	81.0100	81.6491	82.0752	82.5012	(39)
Average = Sum(39)m / 12 =												81.8089	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8956	0.8933	0.8910	0.8796	0.8773	0.8658	0.8658	0.8636	0.8704	0.8773	0.8819	0.8864	(40)
HLP (average)												0.8790	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6655 (42)
Hot water usage for mixer showers												
	68.9107	67.8751	66.3660	63.4787	61.3479	58.9717	57.6211	59.1187	60.7604	63.3117	66.2611	68.6466 (42a)
Hot water usage for baths												
	29.7571	29.3151	28.6928	27.5453	26.6861	25.7334	25.2187	25.8367	26.5096	27.5291	28.7002	29.6565 (42b)
Hot water usage for other uses												
	41.9269	40.4023	38.8777	37.3531	35.8284	34.3038	34.3038	35.8284	37.3531	38.8777	40.4023	41.9269 (42c)
Average daily hot water use (litres/day)												129.2382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	140.5946	137.5925	133.9365	128.3771	123.8625	119.0089	117.1436	120.7839	124.6230	129.7185	135.3635	140.2300	(44)
Energy conte	222.6675	195.9298	205.8554	175.7418	166.7427	146.3353	141.6751	149.5557	153.6727	176.0267	192.8501	219.5663	(45)
Energy content (annual)										Total = Sum(45)m =		2146.6190	
Distribution loss (46)m = 0.15 x (45)m													
	33.4001	29.3895	30.8783	26.3613	25.0114	21.9503	21.2513	22.4333	23.0509	26.4040	28.9275	32.9349	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)
										Total per year (kWh/year) = Sum(64)m =		2491.5440	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	74.0369	65.1467	68.4469	58.4341	55.4419	48.6565	47.1070	49.7273	51.0962	58.5289	64.1227	73.0058	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.8231	25.6004	20.8197	15.7618	11.7821	9.9470	10.7481	13.9707	18.7515	23.8093	27.7890	29.6242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	365.0951	368.8837	359.3367	339.0122	313.3562	289.2432	273.1343	269.3457	278.8927	299.2172	324.8732	348.9862	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	(71)
Water heating gains (Table 5)													
	99.5120	96.9445	91.9985	81.1585	74.5187	67.5785	63.3158	66.8377	70.9669	78.6679	89.0593	98.1261	(72)
Total internal gains													
	600.3975	598.3958	579.1221	542.8998	506.6243	473.7359	454.1654	457.1214	475.5784	508.6616	548.6887	583.7036	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.4800	19.6403	0.3300	0.0000	0.7700	22.3578	(80)
East	5.0600	19.6403	0.3100	0.0000	0.7700	23.7219	(76)
Southeast	7.0100	36.7938	0.3100	0.0000	0.7700	61.5666	(77)
South	2.5300	46.7521	0.3100	0.0000	0.7700	28.2341	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	135.8805	241.2528	350.8413	460.8679	533.8480	536.0797	514.4255	460.1497	389.5522	272.7398	164.6657	114.9788	(83)
Total gains	736.2780	839.6486	929.9634	1003.7677	1040.4723	1009.8156	968.5909	917.2711	865.1306	781.4014	713.3544	698.6825	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.3558	83.5693	83.7840	84.8742	85.0956	86.2204	86.2204	86.4489	85.7669	85.0956	84.6539	84.2167	
alpha	6.5571	6.5713	6.5856	6.6583	6.6730	6.7480	6.7480	6.7633	6.7178	6.6730	6.6436	6.6144	
util living area													
	0.9927	0.9821	0.9514	0.8636	0.7033	0.5080	0.3658	0.4025	0.6335	0.9029	0.9830	0.9946	(86)
MIT	20.2483	20.4154	20.6384	20.8589	20.9686	20.9969	20.9997	20.9995	20.9876	20.8361	20.4989	20.2129	(87)
Th 2	20.1712	20.1732	20.1751	20.1849	20.1868	20.1966	20.1966	20.1986	20.1927	20.1868	20.1829	20.1790	(88)
util rest of house													
	0.9904	0.9766	0.9374	0.8307	0.6505	0.4455	0.2992	0.3327	0.5648	0.8704	0.9768	0.9929	(89)
MIT 2	19.3050	19.5166	19.7921	20.0532	20.1633	20.1950	20.1965	20.1984	20.1855	20.0366	19.6316	19.2663	(90)
Living area fraction										fLA = Living area / (4) =		0.3723	(91)
MIT	19.6562	19.8512	20.1072	20.3532	20.4631	20.4936	20.4956	20.4966	20.4841	20.3343	19.9545	19.6187	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6562	19.8512	20.1072	20.3532	20.4631	20.4936	20.4956	20.4966	20.4841	20.3343	19.9545	19.6187	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9885	0.9740	0.9361	0.8379	0.6690	0.4688	0.3240	0.3587	0.5901	0.8769	0.9747	0.9913	(94)
Useful gains	727.8225	817.8455	870.4957	841.1071	696.0333	473.3742	313.8141	329.0446	510.4867	685.2458	695.2873	692.6360	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1279.9877	1243.0504	1128.4067	937.5815	715.5013	474.9271	313.9200	329.2512	517.1747	794.7967	1055.0317	1272.0606	(97)
Space heating kWh													
	410.8109	285.7377	191.8857	69.4616	14.4842	0.0000	0.0000	0.0000	0.0000	81.5058	259.0159	431.0919	(98a)
Space heating requirement - total per year (kWh/year)												1743.9938	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	410.8109	285.7377	191.8857	69.4616	14.4842	0.0000	0.0000	0.0000	0.0000	81.5058	259.0159	431.0919	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1743.9938	
Space heating per m2											(98c) / (4) =	18.7385	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	410.8109	285.7377	191.8857	69.4616	14.4842	0.0000	0.0000	0.0000	0.0000	81.5058	259.0159	431.0919	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	410.8109	285.7377	191.8857	69.4616	14.4842	0.0000	0.0000	0.0000	0.0000	81.5058	259.0159	431.0919	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	69.6674	61.4906	65.0188	56.4312	54.2042	48.3003	47.2730	49.4520	50.3291	56.7712	61.1616	68.8099	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.0621	13.6044	15.0621	14.5762	15.0621	14.5762	15.0621	15.0621	14.5762	15.0621	14.5762	15.0621	(231)
Lighting	25.2287	20.2394	18.2233	13.3512	10.3128	8.4257	9.4077	12.2285	15.8836	20.8402	23.5389	25.9299	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1743.9938	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	688.9094	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	177.3437	(230a)
Total electricity for the above, kWh/year	177.3437	(231)
Electricity for lighting (calculated in Appendix L)	203.6099	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2813.8568	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1743.9938	16.4900	287.5846	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	688.9094	16.4900	113.6012	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	177.3437	16.4900	29.2440	(249)
Energy for lighting	203.6099	16.4900	33.5753	(250)
Additional standing charges			0.0000	(251)
Total energy cost			464.0050	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2098	(257)
SAP value		80.3886	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1743.9938	0.1573	274.3478	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	688.9094	0.1412	97.2612	(264)
Space and water heating			371.6090	(265)
Pumps, fans and electric keep-hot	177.3437	0.1387	24.5998	(267)
Energy for lighting	203.6099	0.1443	29.3872	(268)
Total CO2, kg/year			425.5960	(272)
CO2 emissions per m2			4.5700	(273)
EI value			95.8695	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	93.0700 (1b)	x	2.5500 (2b)	=	237.3285 (1b) - (3b)	

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 93.0700 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 237.3285 (5)

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2. Ventilation rate
---

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5600	(17)
Infiltration rate		0.1280	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1088	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1170	0.1115	0.1115	0.1034	0.1061	0.0925	0.0925	0.0898	0.0925	0.1034	0.1006	0.1088	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2570	0.2515	0.2515	0.2434	0.2461	0.2325	0.2325	0.2298	0.2325	0.2434	0.2406	0.2488	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window			4.4800	1.1450	5.1298			(27)
Window-Red			14.6000	1.2357	18.0418			(27)
Ground Floor			93.0700	0.1200	11.1684	110.0000	10237.7000	(28a)
Brickwork	87.2700	19.0800	68.1900	0.2100	14.3199	110.0000	7500.8996	(29a)
Communal Wall	13.9000	2.0600	11.8400	0.2200	2.6048	110.0000	1302.4000	(29a)
Total net area of external elements Aum(A, m2)			194.2400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.7367			(33)
Main dwelling								
Party Wall 1			15.9400	0.0000	0.0000	110.0000	1753.4000	(32)
Party Ceiling 1			93.0700			30.0000	2792.1000	(32b)
Internal Wall 1			158.4700			9.0000	1426.2300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	25012.7296 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		268.7518 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	38.1800	0.0380	1.4508
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0970	-0.5141
P1 Party wall - Ground floor	6.0300	0.1080	0.6512
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.0300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.7200	0.0500	0.4360
E4 Jamb	33.7900	0.0160	0.5406
E5 Ground floor (normal)	38.1800	0.1120	4.2762
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.7877 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	61.5244 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.1247	19.6986	19.6986	19.0596	19.2726	18.2075	18.2075	17.9944	18.2075	19.0596	18.8465	19.4856	(38)
Heat transfer coeff	81.6491	81.2231	81.2231	80.5840	80.7970	79.7319	79.7319	79.5189	79.7319	80.5840	80.3710	81.0100	(39)
Average = Sum(39)m / 12 =												80.5130	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8773	0.8727	0.8727	0.8658	0.8681	0.8567	0.8567	0.8544	0.8567	0.8658	0.8636	0.8704	(40)
HLP (average)												0.8651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6655	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.9107	67.8751	66.3660	63.4787	61.3479	58.9717	57.6211	59.1187	60.7604	63.3117	66.2611	68.6466	(42a)
Hot water usage for baths	29.7571	29.3151	28.6928	27.5453	26.6861	25.7334	25.2187	25.8367	26.5096	27.5291	28.7002	29.6565	(42b)
Hot water usage for other uses	41.9269	40.4023	38.8777	37.3531	35.8284	34.3038	34.3038	35.8284	37.3531	38.8777	40.4023	41.9269	(42c)
Average daily hot water use (litres/day)												129.2382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

	140.5946	137.5925	133.9365	128.3771	123.8625	119.0089	117.1436	120.7839	124.6230	129.7185	135.3635	140.2300	(44)
Energy conte	222.6675	195.9298	205.8554	175.7418	166.7427	146.3353	141.6751	149.5557	153.6727	176.0267	192.8501	219.5663	(45)
Energy content (annual)										Total = Sum(45)m =		2146.6190	
Distribution loss (46)m = 0.15 x (45)m													
	33.4001	29.3895	30.8783	26.3613	25.0114	21.9503	21.2513	22.4333	23.0509	26.4040	28.9275	32.9349	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)
										Total per year (kWh/year) = Sum(64)m =		2491.5440	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	74.0369	65.1467	68.4469	58.4341	55.4419	48.6565	47.1070	49.7273	51.0962	58.5289	64.1227	73.0058	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	159.9272	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.8231	25.6004	20.8197	15.7618	11.7821	9.9470	10.7481	13.9707	18.7515	23.8093	27.7890	29.6242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	365.0951	368.8837	359.3367	339.0122	313.3562	289.2432	273.1343	269.3457	278.8927	299.2172	324.8732	348.9862	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	53.6582	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	-106.6181	(71)
Water heating gains (Table 5)													
	99.5120	96.9445	91.9985	81.1585	74.5187	67.5785	63.3158	66.8377	70.9669	78.6679	89.0593	98.1261	(72)
Total internal gains													
	600.3975	598.3958	579.1221	542.8998	506.6243	473.7359	454.1654	457.1214	475.5784	508.6616	548.6887	583.7036	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.4800	23.8018	0.3300	0.0000	0.7700	27.0952	(80)
East	5.0600	23.8018	0.3100	0.0000	0.7700	28.7483	(76)
Southeast	7.0100	43.0593	0.3100	0.0000	0.7700	72.0505	(77)
South	2.5300	54.2217	0.3100	0.0000	0.7700	32.7451	(78)

Solar gains	160.6391	249.3544	360.6082	482.4844	546.2198	581.0674	551.7368	504.6745	427.3180	302.7078	191.7895	136.7063	(83)
Total gains	761.0366	847.7501	939.7303	1025.3842	1052.8441	1054.8033	1005.9021	961.7959	902.8963	811.3694	740.4781	720.4099	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.0956	85.5420	85.5420	86.2204	85.9930	87.1418	87.1418	87.3753	87.1418	86.2204	86.4489	85.7669	
alpha	6.6730	6.7028	6.7028	6.7480	6.7329	6.8095	6.8095	6.8250	6.8095	6.7480	6.7633	6.7178	
util living area													
	0.9881	0.9742	0.9291	0.8045	0.6118	0.3927	0.2616	0.2811	0.5265	0.8443	0.9695	0.9910	(86)
MIT	20.3768	20.5240	20.7356	20.9205	20.9882	20.9995	21.0000	21.0000	20.9966	20.9079	20.6261	20.3442	(87)
Th 2	20.1868	20.1908	20.1908	20.1966	20.1947	20.2045	20.2045	20.2064	20.2045	20.1966	20.1986	20.1927	(88)
util rest of house													
	0.9842	0.9663	0.9095	0.7633	0.5548	0.3328	0.1985	0.2155	0.4583	0.7992	0.9587	0.9880	(89)
MIT 2	19.4801	19.6665	19.9208	20.1276	20.1869	20.2043	20.2045	20.2064	20.2028	20.1198	19.8016	19.4439	(90)
Living area fraction										fLA = Living area / (4) =		0.3723	(91)
MIT	19.8140	19.9858	20.2242	20.4228	20.4852	20.5003	20.5006	20.5019	20.4983	20.4132	20.1085	19.7791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8140	19.9858	20.2242	20.4228	20.4852	20.5003	20.5006	20.5019	20.4983	20.4132	20.1085	19.7791	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9639	0.9104	0.7754	0.5756	0.3551	0.2220	0.2399	0.4837	0.8122	0.9572	0.9861	(94)
Useful gains	747.3690	817.1660	855.5129	795.1304	606.0587	374.5567	223.2939	230.7424	436.7397	659.0067	708.7895	710.4039	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1201.3818	1160.3355	1041.6192	847.9671	612.8645	374.7670	223.3000	230.7527	438.3921	718.2635	973.1753	1189.1558	(97)
Space heating kWh													
	337.7856	230.6099	138.4631	38.0424	5.0635	0.0000	0.0000	0.0000	0.0000	44.0871	190.3578	356.1914	(98a)
Space heating requirement - total per year (kWh/year)												1340.6008	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

337.7856	230.6099	138.4631	38.0424	5.0635	0.0000	0.0000	0.0000	0.0000	44.0871	190.3578	356.1914	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1340.6008

Space heating per m2 (98c) / (4) = 14.4042 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	337.7856	230.6099	138.4631	38.0424	5.0635	0.0000	0.0000	0.0000	0.0000	44.0871	190.3578	356.1914	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	337.7856	230.6099	138.4631	38.0424	5.0635	0.0000	0.0000	0.0000	0.0000	44.0871	190.3578	356.1914	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	251.9625	222.3898	235.1504	204.0918	196.0377	174.6853	170.9701	178.8507	182.0227	205.3217	221.2001	248.8613	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	69.6674	61.4906	65.0188	56.4312	54.2042	48.3003	47.2730	49.4520	50.3291	56.7712	61.1616	68.8099	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.0621	13.6044	15.0621	14.5762	15.0621	14.5762	15.0621	15.0621	14.5762	15.0621	14.5762	15.0621	(231)
Lighting	25.2287	20.2394	18.2233	13.3512	10.3128	8.4257	9.4077	12.2285	15.8836	20.8402	23.5389	25.9299	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1340.6008 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 688.9094 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)
mechanical ventilation fans (SFP = 0.6125) 177.3437 (230a)
Total electricity for the above, kWh/year 177.3437 (231)
Electricity for lighting (calculated in Appendix L) 203.6099 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2410.4638 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1340.6008	27.6700	370.9443	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	688.9094	27.6700	190.6212	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	177.3437	27.6700	49.0710	(249)
Energy for lighting	203.6099	27.6700	56.3389	(250)
Additional standing charges			0.0000	(251)
Total energy cost			666.9753	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1340.6008	0.1582	212.0490	(261)

Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	688.9094	0.1412	97.2612 (264)
Space and water heating			309.3102 (265)
Pumps, fans and electric keep-hot	177.3437	0.1387	24.5998 (267)
Energy for lighting	203.6099	0.1443	29.3872 (268)
Total CO2, kg/year			363.2972 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1340.6008	1.5855	2125.5541	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	688.9094	1.5221	1048.5556	(278)
Space and water heating			3174.1096	(279)
Pumps, fans and electric keep-hot	177.3437	1.5128	268.2856	(281)
Energy for lighting	203.6099	1.5338	312.3037	(282)
Total Primary energy kWh/year			3754.6989	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-23	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-23
Plot Address	Flat 3, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	4.74	**TER**	12.36
Environmental	96 A	**% DER < TER**			61.65
CO_2 Emissions (t/year)	0.3	**DFEE**	35.72	**TFEE**	34.89
Compliance Check	See BREL	**% DFEE < TFEE**			-2.38
% DPER < TPER	25.14	**DPER**	48.90	**TPER**	65.32

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	272.82	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	29.28 m	80.15 m²	2.55 m

8.0 Living Area	25.85	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	43.02	24.59	0.00	None	18.43	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	15.14	13.08	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	18.44	18.44	0.60	Stairwell Access Corridor 2	0.00	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.00	110.00	7.73	7.73	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	38.96	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	160.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)

Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	80.15

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
EF UH Corridor	Exposed Floor - Solid	Lowest occupied	Other	0.14	None	0.00	110.00	27.58

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	52.57

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	West	2.06	
Patio Door	Window-Red	Brickwork	East	13.01	
East	Window-Red	Brickwork	East	5.42	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	50.45	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	8.64	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	27.06	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	8.10	0.33	0.33	Abbey Calculated	No
E16 Corner (normal)	Gov Approved Scheme	11.52	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	8.64	-0.10	-0.10	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	5.76	0.03	0.03	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	8.70	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.60	0.02	0.02	RCD	Yes
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value	0.08	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0

Summary for Input Data

elmhurst energy

Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.91	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	12
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes

Summary for Input Data

Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-23	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-23
Plot Address	Flat 3, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	4.74	**TER**	12.36
Environmental	96 A	**% DER < TER**			61.65
CO_2 Emissions (t/year)	0.3	**DFEE**	35.72	**TFEE**	34.89
Compliance Check	See BREL	**% DFEE < TFEE**			-2.38
% DPER < TPER	25.14	**DPER**	48.90	**TPER**	65.32

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	204.3825	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9100	(17)
Infiltration rate		0.1455	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1237	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1577	0.1546	0.1515	0.1360	0.1330	0.1175	0.1175	0.1144	0.1237	0.1330	0.1391	0.1453	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2937	0.2906	0.2875	0.2720	0.2690	0.2535	0.2535	0.2504	0.2597	0.2690	0.2751	0.2813	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
EF UH Corridor			27.5800	0.1400	3.8612	110.0000	3033.8000	(28b)
Brickwork	43.0200	18.4300	24.5900	0.2100	5.1639	110.0000	2704.9001	(29a)
Communal Wall	15.1400	2.0600	13.0800	0.2200	2.8776	110.0000	1438.8000	(29a)
Stairwell Wall	18.4400		18.4400	0.2200	4.0568	110.0000	2028.4001	(29a)
Lift Shaft Wall	7.7300		7.7300	0.0000	0.0000	110.0000	850.3000	(29a)
Total net area of external elements Aum(A, m2)			104.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.2062			(33)
Main dwelling								
Party Wall 1			38.9600	0.0000	0.0000	110.0000	4285.5999	(32)
Party Floor 1			52.5700			70.0000	3679.9000	(32d)
Party Ceiling 1			80.1500			30.0000	2404.5000	(32b)
Internal Wall 1			160.0000			9.0000	1440.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21866.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 272.8160 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	50.4500	0.0380	1.9171
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3576 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.5638 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8080	19.5995	19.3909	18.3482	18.1397	17.0970	17.0970	16.8885	17.5141	18.1397	18.5568	18.9738	(38)
Heat transfer coeff	69.3718	69.1632	68.9547	67.9120	67.7035	66.6608	66.6608	66.4523	67.0779	67.7035	68.1206	68.5376	(39)
Average = Sum(39)m / 12 =												67.8599	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8655	0.8629	0.8603	0.8473	0.8447	0.8317	0.8317	0.8291	0.8369	0.8447	0.8499	0.8551	(40)
HLP (average)												0.8467	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)
Hot water usage for mixer showers

65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day) 122.9552 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
										Total per year (kWh/year) = Sum(64)m =		2387.1855	(64)
12Total per year (kWh/year)												2387	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8405	122.7163	110.8405	114.5352	110.8405	114.5352	110.8405	110.8405	114.5352	110.8405	114.5352	110.8405	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains	485.2539	496.9674	474.6398	455.7880	430.3338	412.9119	395.4656	396.5358	409.9053	425.7706	454.7941	474.2392	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	19.6403	0.3100	0.0000	0.7700	86.4023	(76)

Solar gains	86.4023	169.0211	278.3537	405.9623	497.5221	509.3024	484.8766	416.5019	323.7369	200.5578	107.7335	71.0530	(83)
Total gains	571.6562	665.9886	752.9936	861.7504	927.8559	922.2142	880.3422	813.0377	733.6422	626.3285	562.5276	545.2922	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	87.5564	87.8204	88.0860	89.4384	89.7139	91.1172	91.1172	91.4031	90.5506	89.7139	89.1646	88.6220	
alpha	6.8371	6.8547	6.8724	6.9626	6.9809	7.0745	7.0745	7.0935	7.0367	6.9809	6.9443	6.9081	
util living area	0.9959	0.9879	0.9606	0.8527	0.6633	0.4615	0.3331	0.3757	0.6215	0.9196	0.9889	0.9970	(86)
MIT	20.2277	20.4026	20.6372	20.8857	20.9814	20.9987	20.9999	20.9998	20.9910	20.8314	20.4866	20.2018	(87)
Th 2	20.1969	20.1991	20.2014	20.2125	20.2148	20.2259	20.2259	20.2282	20.2215	20.2148	20.2103	20.2058	(88)
util rest of house	0.9946	0.9841	0.9487	0.8190	0.6126	0.4062	0.2745	0.3128	0.5555	0.8909	0.9847	0.9960	(89)
MIT 2	19.2983	19.5214	19.8135	20.1070	20.2012	20.2253	20.2259	20.2281	20.2163	20.0578	19.6382	19.2724	(90)
Living area fraction										fLA = Living area / (4) =		0.3225	(91)
MIT	19.5981	19.8056	20.0791	20.3581	20.4528	20.4747	20.4755	20.4770	20.4661	20.3073	19.9118	19.5722	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5981	19.8056	20.0791	20.3581	20.4528	20.4747	20.4755	20.4770	20.4661	20.3073	19.9118	19.5722	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9817	0.9466	0.8256	0.6283	0.4241	0.2934	0.3331	0.5766	0.8947	0.9826	0.9949	(94)
Useful gains	567.7876	653.7989	712.7857	711.4618	582.9651	391.0878	258.3152	270.8502	423.0141	560.3895	552.7598	542.4966	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1061.2536	1030.9178	936.3458	778.1457	592.5948	391.6146	258.3464	270.9246	427.0263	657.2199	872.7484	1053.5718	(97)
Space heating kWh	367.1387	253.4239	166.3287	48.0124	7.1645	0.0000	0.0000	0.0000	0.0000	72.0418	230.3918	380.2400	(98a)
Space heating requirement - total per year (kWh/year)												1524.7418	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	367.1387	253.4239	166.3287	48.0124	7.1645	0.0000	0.0000	0.0000	0.0000	72.0418	230.3918	380.2400	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1524.7418	
Space heating per m2											(98c) / (4) =	19.0236	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	367.1387	253.4239	166.3287	48.0124	7.1645	0.0000	0.0000	0.0000	0.0000	72.0418	230.3918	380.2400	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	367.1387	253.4239	166.3287	48.0124	7.1645	0.0000	0.0000	0.0000	0.0000	72.0418	230.3918	380.2400	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417	(231)
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1524.7418	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	660.0543	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	146.4912	(230a)
Total electricity for the above, kWh/year	146.4912	(231)
Electricity for lighting (calculated in Appendix L)	182.0700	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2513.3574	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1524.7418	0.1575	240.2172	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			333.3931	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			379.9916	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.7400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1524.7418	1.5832	2413.9828	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	1.5220	1004.5938	(278)
Space and water heating			3418.5766	(279)
Pumps, fans and electric keep-hot	146.4912	1.5128	221.6118	(281)
Energy for lighting	182.0700	1.5338	279.2651	(282)
Total Primary energy kWh/year			3919.4535	(286)
Dwelling Primary energy Rate (DPER)			48.9000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		204.3825	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	3 * 10 = 30.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1468	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3968	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3373	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4300	0.4216	0.4132	0.3710	0.3626	0.3204	0.3204	0.3120	0.3373	0.3626	0.3794	0.3963	(22b)
Effective ac	0.5925	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.9800	1.1450	20.5878			(27)
EF UH Corridor			27.5800	0.1300	3.5854			(28b)
Brickwork	43.0200	17.9800	25.0400	0.1800	4.5072			(29a)
Communal Wall	15.1400	2.0600	13.0800	0.1800	2.3544			(29a)
Stairwell Wall	18.4400		18.4400	0.1800	3.3192			(29a)
Lift Shaft Wall	7.7300		7.7300	0.1800	1.3914			(29a)
Total net area of external elements Aum(A, m2)			111.9100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.8054			(33)
Main dwelling								
Party Wall 1			38.9600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 272.8160 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	50.4500	0.0700	3.5315	
E18 Party wall between dwellings	8.6400	0.0600	0.5184	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.0200	0.1620	
E16 Corner (normal)	11.5200	0.0900	1.0368	
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0900	-0.7776	
E25 Staggered party wall between dwellings	5.7600	0.0600	0.3456	
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350	
E4 Jamb	18.6000	0.0500	0.9300	
E5 Ground floor (normal)	24.5000	0.1600	3.9200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1017 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.9071 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.9589	39.7168	39.4794	38.3646	38.1560	37.1851	37.1851	37.0052	37.5591	38.1560	38.5780	39.0191	(38)
Heat transfer coeff	87.8660	87.6239	87.3865	86.2717	86.0631	85.0921	85.0921	84.9123	85.4661	86.0631	86.4851	86.9262	(39)

Average = Sum(39)m / 12 = 86.2707

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0963	1.0932	1.0903	1.0764	1.0738	1.0617	1.0617	1.0594	1.0663	1.0738	1.0790	1.0845	(40)
HLP (average)												1.0764	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)

Hot water usage for mixer showers

65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day) 122.9552 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.4371	228.4904	242.4427	212.2900	205.2316	184.3133	181.3825	188.8798	191.2935	214.0638	228.5663	255.4866	(62)
WWHRS	-29.9719	-26.5074	-27.7571	-22.9839	-21.4202	-18.3294	-17.1809	-18.2702	-18.9643	-22.3568	-25.3276	-29.4169	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.4652	201.9830	214.6857	189.3061	183.8114	165.9839	164.2016	170.6097	172.3292	191.7070	203.2387	226.0697	(64)
									Total per year (kWh/year) = Sum(64)m =			2312.3912	(64)
12Total per year (kWh/year)												2312	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	107.7135	95.6481	102.3953	91.6669	90.0226	82.3646	82.0928	84.5857	84.6855	92.9593	97.0787	106.7324	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8291	122.7036	110.8291	114.5234	110.8291	114.5234	110.8291	110.8291	114.5234	110.8291	114.5234	110.8291	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)													
	144.7762	142.3335	137.6281	127.3151	120.9981	114.3953	110.3398	113.6904	117.6188	124.9453	134.8316	143.4576	(72)
Total internal gains													
	538.3445	550.0568	527.7304	508.8782	483.4244	463.0020	445.5561	446.6264	459.9955	478.8612	507.8843	527.3298	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	17.9800	19.6403	0.6300	0.7000	0.7700	107.9217	(76)

Solar gains	107.9217	211.1178	347.6809	507.0718	621.4356	636.1499	605.6406	520.2364	404.3673	250.5090	134.5657	88.7496	(83)
Total gains	646.2662	761.1745	875.4113	1015.9501	1104.8600	1099.1519	1051.1968	966.8627	864.3627	729.3702	642.4500	616.0793	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.1273	69.3184	69.5067	70.4048	70.5755	71.3808	71.3808	71.5319	71.0684	70.5755	70.2311	69.8747	
alpha	5.6085	5.6212	5.6338	5.6937	5.7050	5.7587	5.7587	5.7688	5.7379	5.7050	5.6821	5.6583	
util living area													
	0.9943	0.9854	0.9579	0.8619	0.6886	0.4910	0.3556	0.4027	0.6561	0.9229	0.9866	0.9956	(86)
MIT	19.9617	20.1678	20.4599	20.7875	20.9499	20.9938	20.9992	20.9984	20.9714	20.7195	20.2824	19.9315	(87)
Th 2	20.0039	20.0064	20.0088	20.0202	20.0223	20.0323	20.0323	20.0341	20.0284	20.0223	20.0180	20.0135	(88)
util rest of house													
	0.9924	0.9806	0.9444	0.8252	0.6279	0.4189	0.2777	0.3189	0.5746	0.8920	0.9812	0.9941	(89)
MIT 2	18.8109	19.0733	19.4367	19.8240	19.9859	20.0293	20.0321	20.0336	20.0121	19.7623	19.2292	18.7797	(90)
Living area fraction									fLA = Living area / (4) =			0.3225	(91)
MIT	19.1820	19.4263	19.7667	20.1347	20.2968	20.3404	20.3440	20.3448	20.3215	20.0710	19.5689	19.1512	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1820	19.4263	19.7667	20.1347	20.2968	20.3404	20.3440	20.3448	20.3215	20.0710	19.5689	19.1512	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9902	0.9769	0.9404	0.8299	0.6456	0.4421	0.3028	0.3459	0.6000	0.8938	0.9780	0.9922	(94)
Useful gains	639.9289	743.5871	823.2778	843.1091	713.2502	485.9083	318.3534	334.4783	518.6349	651.9085	628.3157	611.3013	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1307.6257	1272.8479	1159.3325	969.2398	739.8664	488.4612	318.5830	334.9623	531.7263	815.1070	1078.3713	1299.6529	(97)
Space heating kWh													
	496.7664	355.6633	250.0247	90.8142	19.8024	0.0000	0.0000	0.0000	0.0000	121.4197	324.0400	512.1336	(98a)
Space heating requirement - total per year (kWh/year)												2170.6642	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	496.7664	355.6633	250.0247	90.8142	19.8024	0.0000	0.0000	0.0000	0.0000	121.4197	324.0400	512.1336	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2170.6642	
Space heating per m2										(98c) / (4) =		27.0825	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	496.7664	355.6633	250.0247	90.8142	19.8024	0.0000	0.0000	0.0000	0.0000	121.4197	324.0400	512.1336	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	538.2085	385.3340	270.8826	98.3902	21.4544	0.0000	0.0000	0.0000	0.0000	131.5489	351.0726	554.8576	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	228.4652	201.9830	214.6857	189.3061	183.8114	165.9839	164.2016	170.6097	172.3292	191.7070	203.2387	226.0697	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7533	85.3149	84.4024	82.5111	80.5944	79.8000	79.8000	79.8000	79.8000	83.0645	85.1005	85.8354	(217)
Fuel for water heating, kWh/month													
	266.4216	236.7501	254.3597	229.4310	228.0696	207.9998	205.7664	213.7966	215.9514	230.7930	238.8219	263.3760	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.0281	18.4740	16.6338	12.1866	9.4133	7.6907	8.5871	11.1619	14.4982	19.0224	21.4857	23.6681	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3577	-31.5802	-47.5826	-56.1624	-62.8907	-59.5473	-58.8114	-54.3583	-46.9199	-37.2652	-23.9936	-18.2969	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9812	-17.1319	-34.6992	-53.0827	-71.1471	-71.8453	-71.0093	-59.6908	-43.1804	-24.8245	-10.7585	-6.2867	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2351.7489	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2791.5370	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	185.8499	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-990.4037	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4424.7321	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2351.7489	0.2100	493.8673	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2791.5370	0.2100	586.2228	(264)
Space and water heating			1080.0900	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	185.8499	0.1443	26.8239	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.7662	0.1336	-69.3067	
PV Unit electricity exported	-471.6375	0.1254	-59.1233	
Total			-128.4300	(269)
Total CO2, kg/year			990.4132	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2351.7489	1.1300	2657.4762	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2791.5370	1.1300	3154.4368	(278)
Space and water heating			5811.9131	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	185.8499	1.5338	285.0627	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.7662	1.4937	-774.8827	
PV Unit electricity exported	-471.6375	0.4601	-217.0111	
Total			-991.8938	(283)
Total Primary energy kWh/year			5235.1828	(286)
Target Primary Energy Rate (TPER)			65.3200	(287)

Full SAP Calculation Printout

Plot Reference	P-23	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-23
Plot Address	Flat 3, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	4.74	**TER**	12.36
Environmental	96 A	**% DER < TER**			61.65
CO_2 Emissions (t/year)	0.3	**DFEE**	35.72	**TFEE**	34.89
Compliance Check	See BREL	**% DFEE < TFEE**			-2.38
% DPER < TPER	25.14	**DPER**	48.90	**TPER**	65.32

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	204.3825	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1468	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9100	(17)
Infiltration rate		0.2923	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2484	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3168	0.3106	0.3043	0.2733	0.2671	0.2360	0.2360	0.2298	0.2484	0.2671	0.2795	0.2919	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5502	0.5482	0.5463	0.5373	0.5357	0.5279	0.5279	0.5264	0.5309	0.5357	0.5391	0.5426	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
EF UH Corridor			27.5800	0.1400	3.8612	110.0000	3033.8000	(28b)
Brickwork	43.0200	18.4300	24.5900	0.2100	5.1639	110.0000	2704.9001	(29a)
Communal Wall	15.1400	2.0600	13.0800	0.2200	2.8776	110.0000	1438.8000	(29a)
Stairwell Wall	18.4400		18.4400	0.2200	4.0568	110.0000	2028.4001	(29a)
Lift Shaft Wall	7.7300		7.7300	0.0000	0.0000	110.0000	850.3000	(29a)
Total net area of external elements Aum(A, m2)			104.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.2062			(33)
Main dwelling								
Party Wall 1			38.9600	0.0000	0.0000	110.0000	4285.5999	(32)
Party Floor 1			52.5700			70.0000	3679.9000	(32d)
Party Ceiling 1			80.1500			30.0000	2404.5000	(32b)
Internal Wall 1			160.0000			9.0000	1440.0000	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			21866.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							272.8160	(35)
List of Thermal Bridges								

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	50.4500	0.0380	1.9171	
E18 Party wall between dwellings	8.6400	0.0380	0.3283	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730	
E16 Corner (normal)	11.5200	0.0540	0.6221	
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381	
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786	
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350	
E4 Jamb	18.6000	0.0160	0.2976	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.3576	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	49.5638	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.1068	36.9754	36.8466	36.2417	36.1285	35.6017	35.6017	35.5041	35.8046	36.1285	36.3575	36.5969	(38)
Heat transfer coeff	86.6706	86.5392	86.4104	85.8055	85.6923	85.1655	85.1655	85.0679	85.3684	85.6923	85.9213	86.1607	(39)
Average = Sum(39)m / 12 =												85.8050	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0814	1.0797	1.0781	1.0706	1.0691	1.0626	1.0626	1.0614	1.0651	1.0691	1.0720	1.0750	(40)
HLP (average)												1.0706	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day) 62.5098 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1980	66.3272	64.2848	61.7426	59.4748	57.1179	56.6282	58.6665	60.7571	63.1774	65.7421	68.1023	(44)
Energy conte	108.0090	94.4491	98.8034	84.5226	80.0645	70.2332	68.4869	72.6414	74.9195	85.7311	93.6616	106.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1038.1541	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.8076	80.2818	83.9829	71.8442	68.0548	59.6982	58.2139	61.7452	63.6816	72.8715	79.6124	90.6370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.8076	80.2818	83.9829	71.8442	68.0548	59.6982	58.2139	61.7452	63.6816	72.8715	79.6124	90.6370	(64)
									Total per year (kWh/year) = Sum(64)m =			882.4310	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.5038	46.7813	51.0834	48.7482	49.6630	47.3737	48.9528	49.6630	48.7482	51.0834	50.1228	52.5038	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							597.2272	(64a)
Heat gains from water heating, kWh/month	36.0779	31.7658	33.7666	30.1481	29.4295	26.7680	26.7917	27.8520	28.1075	30.9887	32.4338	35.7852	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8405	122.7163	110.8405	114.5352	110.8405	114.5352	110.8405	110.8405	114.5352	110.8405	114.5352	110.8405	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	48.4917	47.2705	45.3852	41.8724	39.5557	37.1777	36.0103	37.4355	39.0381	41.6515	45.0469	48.0984	(72)
Total internal gains	439.0715	452.0064	432.4989	420.4473	398.9935	385.7963	371.2381	370.3830	381.4267	392.5788	415.1115	428.9821	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	19.6403	0.3100	0.0000	0.7700	86.4023	(76)

Solar gains	86.4023	169.0211	278.3537	405.9623	497.5221	509.3024	484.8766	416.5019	323.7369	200.5578	107.7335	71.0530	(83)
Total gains	525.4738	621.0276	710.8526	826.4097	896.5155	895.0987	856.1147	786.8849	705.1636	593.1366	522.8450	500.0351	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.0808	70.1872	70.2918	70.7873	70.8808	71.3193	71.3193	71.4011	71.1498	70.8808	70.6920	70.4956	
alpha	5.6721	5.6791	5.6861	5.7192	5.7254	5.7546	5.7546	5.7601	5.7433	5.7254	5.7128	5.6997	
util living area	0.9980	0.9943	0.9824	0.9295	0.7969	0.5947	0.4356	0.4928	0.7657	0.9652	0.9950	0.9985	(86)
MIT	19.8350	20.0206	20.2996	20.6584	20.8957	20.9839	20.9977	20.9955	20.9378	20.5969	20.1478	19.8019	(87)
Th 2	20.0161	20.0174	20.0188	20.0249	20.0261	20.0315	20.0315	20.0325	20.0294	20.0261	20.0238	20.0213	(88)
util rest of house	0.9972	0.9923	0.9759	0.9051	0.7398	0.5111	0.3409	0.3916	0.6840	0.9482	0.9928	0.9979	(89)
MIT 2	18.9583	19.1438	19.4196	19.7637	19.9626	20.0251	20.0310	20.0314	19.9993	19.7158	19.2762	18.9294	(90)
Living area fraction										fLA = Living area / (4) =		0.3225	(91)
MIT	19.2410	19.4266	19.7034	20.0523	20.2635	20.3343	20.3428	20.3424	20.3020	20.0000	19.5573	19.2108	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2410	19.4266	19.7034	20.0523	20.2635	20.3343	20.3428	20.3424	20.3020	20.0000	19.5573	19.2108	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9964	0.9907	0.9733	0.9059	0.7547	0.5379	0.3715	0.4244	0.7086	0.9476	0.9914	0.9973	(94)
Useful gains	523.5953	615.2485	691.8647	748.6534	676.6394	481.4594	318.0759	333.9484	499.7072	562.0541	518.3446	498.6700	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1294.9483	1257.1168	1140.9115	956.9269	733.8294	488.3668	318.7560	335.3681	529.4534	805.5049	1070.3468	1293.3372	(97)
Space heating kWh	573.8866	431.3355	334.0909	149.9569	42.5493	0.0000	0.0000	0.0000	0.0000	181.1274	397.4416	591.2324	(98a)
Space heating requirement - total per year (kWh/year)												2701.6206	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	573.8866	431.3355	334.0909	149.9569	42.5493	0.0000	0.0000	0.0000	0.0000	181.1274	397.4416	591.2324	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2701.6206	
Space heating per m2											(98c) / (4) =	33.7071	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	800.5553	630.2244	646.5159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9296	0.9677	0.9490	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	744.2072	609.8369	613.5567	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1003.5858	960.1781	881.4233	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	186.7526	260.6539	199.2927	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.6881	65.1635	49.8232	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												161.6748	(107)
Energy for space heating												33.7071	(99)
Energy for space cooling												2.0172	(108)
Total												35.7242	(109)
Fabric Energy Efficiency (DFEE)												35.7	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		204.3825	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) =	0.1468	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3968	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3373	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4300	0.4216	0.4132	0.3710	0.3626	0.3204	0.3204	0.3120	0.3373	0.3626	0.3794	0.3963	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5925	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.9800	1.1450	20.5878			(27)
EF UH Corridor			27.5800	0.1300	3.5854			(28b)
Brickwork	43.0200	17.9800	25.0400	0.1800	4.5072			(29a)
Communal Wall	15.1400	2.0600	13.0800	0.1800	2.3544			(29a)
Stairwell Wall	18.4400		18.4400	0.1800	3.3192			(29a)
Lift Shaft Wall	7.7300		7.7300	0.1800	1.3914			(29a)
Total net area of external elements Aum(A, m2)			111.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.8054			(33)
Main dwelling								
Party Wall 1			38.9600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	272.8160	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	50.4500	0.0700	3.5315
E18 Party wall between dwellings	8.6400	0.0600	0.5184
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.0200	0.1620
E16 Corner (normal)	11.5200	0.0900	1.0368
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0900	-0.7776
E25 Staggered party wall between dwellings	5.7600	0.0600	0.3456
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.6000	0.0500	0.9300
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.1017	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	47.9071	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.9589	39.7168	39.4794	38.3646	38.1560	37.1851	37.1851	37.0052	37.5591	38.1560	38.5780	39.0191	(38)
Heat transfer coeff	87.8660	87.6239	87.3865	86.2717	86.0631	85.0921	85.0921	84.9123	85.4661	86.0631	86.4851	86.9262	(39)
Average = Sum(39)m / 12 =												86.2707	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0963	1.0932	1.0903	1.0764	1.0738	1.0617	1.0617	1.0594	1.0663	1.0738	1.0790	1.0845	(40)
HLP (average)												1.0764	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4657	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)
Hot water usage for other uses	39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)
Average daily hot water use (litres/day)												62.5098	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1980	66.3272	64.2848	61.7426	59.4748	57.1179	56.6282	58.6665	60.7571	63.1774	65.7421	68.1023	(44)
Energy conte	108.0090	94.4491	98.8034	84.5226	80.0645	70.2332	68.4869	72.6414	74.9195	85.7311	93.6616	106.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1038.1541	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.8076	80.2818	83.9829	71.8442	68.0548	59.6982	58.2139	61.7452	63.6816	72.8715	79.6124	90.6370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.8076	80.2818	83.9829	71.8442	68.0548	59.6982	58.2139	61.7452	63.6816	72.8715	79.6124	90.6370	(64)
										Total per year (kWh/year) = Sum(64)m =		882.4310	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.5038	46.7813	51.0834	48.7482	49.6630	47.3737	48.9528	49.6630	48.7482	51.0834	50.1228	52.5038	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		597.2272	(64a)

Heat gains from water heating, kWh/month

	36.0779	31.7658	33.7666	30.1481	29.4295	26.7680	26.7917	27.8520	28.1075	30.9887	32.4338	35.7852 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	110.8291	122.7036	110.8291	114.5234	110.8291	114.5234	110.8291	110.8291	114.5234	110.8291	114.5234	110.8291	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)													
	48.4917	47.2705	45.3852	41.8724	39.5557	37.1777	36.0103	37.4355	39.0381	41.6515	45.0469	48.0984	(72)
Total internal gains													
	439.0601	451.9937	432.4874	420.4355	398.9820	385.7845	371.2266	370.3715	381.4148	392.5673	415.0996	428.9706	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	17.9800	19.6403	0.6300	0.7000	0.7700	107.9217	(76)

Solar gains	107.9217	211.1178	347.6809	507.0718	621.4356	636.1499	605.6406	520.2364	404.3673	250.5090	134.5657	88.7496	(83)
Total gains	546.9818	663.1115	780.1683	927.5073	1020.4176	1021.9344	976.8673	890.6079	785.7821	643.0764	549.6653	517.7201	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.1273	69.3184	69.5067	70.4048	70.5755	71.3808	71.3808	71.5319	71.0684	70.5755	70.2311	69.8747	
alpha	5.6085	5.6212	5.6338	5.6937	5.7050	5.7587	5.7587	5.7688	5.7379	5.7050	5.6821	5.6583	
util living area													
	0.9975	0.9923	0.9739	0.8960	0.7317	0.5262	0.3823	0.4364	0.7083	0.9521	0.9936	0.9982	(86)
MIT	19.8396	20.0519	20.3607	20.7311	20.9321	20.9913	20.9988	20.9976	20.9581	20.6426	20.1717	19.8097	(87)
Th 2	20.0039	20.0064	20.0088	20.0202	20.0223	20.0323	20.0323	20.0341	20.0284	20.0223	20.0180	20.0135	(88)
util rest of house													
	0.9966	0.9896	0.9649	0.8646	0.6713	0.4497	0.2988	0.3460	0.6253	0.9301	0.9909	0.9975	(89)
MIT 2	18.9530	19.1657	19.4697	19.8213	19.9828	20.0289	20.0320	20.0335	20.0091	19.7534	19.2950	18.9309	(90)
Living area fraction										fLA = Living area / (4) =		0.3225	(91)
MIT	19.2390	19.4515	19.7571	20.1147	20.2890	20.3393	20.3438	20.3445	20.3151	20.0402	19.5778	19.2143	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2390	19.4515	19.7571	20.1147	20.2890	20.3393	20.3438	20.3445	20.3151	20.0402	19.5778	19.2143	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9877	0.9620	0.8680	0.6885	0.4743	0.3258	0.3752	0.6511	0.9306	0.9893	0.9968	(94)
Useful gains	544.6212	654.9377	750.5509	805.0360	702.6064	484.7156	318.2323	334.1923	511.5844	598.4460	543.7641	516.0475	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1312.6275	1275.0572	1158.4917	967.5114	739.1941	488.3699	318.5709	334.9345	531.1834	812.4514	1079.1414	1305.1387	(97)
Space heating kWh													
	571.3967	416.7203	303.5080	116.9823	27.2212	0.0000	0.0000	0.0000	0.0000	159.2200	385.4717	587.0838	(98a)
Space heating requirement - total per year (kWh/year)												2567.6040	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	571.3967	416.7203	303.5080	116.9823	27.2212	0.0000	0.0000	0.0000	0.0000	159.2200	385.4717	587.0838	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2567.6040	
Space heating per m2										(98c) / (4) =		32.0350	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	799.8662	629.6819	645.3337	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9591	0.9825	0.9705	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	767.1561	618.6495	626.2667	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1151.8482	1101.3297	1002.6700	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	276.9783	359.1141	280.0441	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	69.2446	89.7785	70.0110	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												229.0341	(107)
Energy for space heating												32.0350	(99)
Energy for space cooling												2.8576	(108)
Total												34.8926	(109)
Fabric Energy Efficiency (TFEE)												34.9	(109)

Full SAP Calculation Printout

Plot Reference	P-23	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-23
Plot Address	Flat 3, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	4.74	**TER**	12.36
Environmental	96 A	**% DER < TER**			61.65
CO_2 Emissions (t/year)	0.3	**DFEE**	35.72	**TFEE**	34.89
Compliance Check	See BREL	**% DFEE < TFEE**			-2.38
% DPER < TPER	25.14	**DPER**	48.90	**TPER**	65.32

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	204.3825	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9100	(17)
Infiltration rate		0.1455	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1237	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1577	0.1546	0.1515	0.1360	0.1330	0.1175	0.1175	0.1144	0.1237	0.1330	0.1391	0.1453	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2937	0.2906	0.2875	0.2720	0.2690	0.2535	0.2535	0.2504	0.2597	0.2690	0.2751	0.2813	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
EF UH Corridor			27.5800	0.1400	3.8612	110.0000	3033.8000	(28b)
Brickwork	43.0200	18.4300	24.5900	0.2100	5.1639	110.0000	2704.9001	(29a)
Communal Wall	15.1400	2.0600	13.0800	0.2200	2.8776	110.0000	1438.8000	(29a)
Stairwell Wall	18.4400		18.4400	0.2200	4.0568	110.0000	2028.4001	(29a)
Lift Shaft Wall	7.7300		7.7300	0.0000	0.0000	110.0000	850.3000	(29a)
Total net area of external elements Aum(A, m2)			104.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.2062			(33)
Main dwelling								
Party Wall 1			38.9600	0.0000	0.0000	110.0000	4285.5999	(32)
Party Floor 1			52.5700			70.0000	3679.9000	(32d)
Party Ceiling 1			80.1500			30.0000	2404.5000	(32b)
Internal Wall 1			160.0000			9.0000	1440.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21866.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 272.8160 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	50.4500	0.0380	1.9171
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3576 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.5638 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8080	19.5995	19.3909	18.3482	18.1397	17.0970	17.0970	16.8885	17.5141	18.1397	18.5568	18.9738	(38)
Heat transfer coeff	69.3718	69.1632	68.9547	67.9120	67.7035	66.6608	66.6608	66.4523	67.0779	67.7035	68.1206	68.5376	(39)
Average = Sum(39)m / 12 =												67.8599	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8655	0.8629	0.8603	0.8473	0.8447	0.8317	0.8317	0.8291	0.8369	0.8447	0.8499	0.8551	(40)
HLP (average)												0.8467	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)
Hot water usage for mixer showers

65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day) 122.9552 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
										Total per year (kWh/year) = Sum(64)m =		2387.1855	(64)
12Total per year (kWh/year)												2387	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8405	122.7163	110.8405	114.5352	110.8405	114.5352	110.8405	110.8405	114.5352	110.8405	114.5352	110.8405	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains	485.2539	496.9674	474.6398	455.7880	430.3338	412.9119	395.4656	396.5358	409.9053	425.7706	454.7941	474.2392	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	19.6403	0.3100	0.0000	0.7700	86.4023	(76)

Solar gains	86.4023	169.0211	278.3537	405.9623	497.5221	509.3024	484.8766	416.5019	323.7369	200.5578	107.7335	71.0530	(83)
Total gains	571.6562	665.9886	752.9936	861.7504	927.8559	922.2142	880.3422	813.0377	733.6422	626.3285	562.5276	545.2922	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	87.5564	87.8204	88.0860	89.4384	89.7139	91.1172	91.1172	91.4031	90.5506	89.7139	89.1646	88.6220	
alpha	6.8371	6.8547	6.8724	6.9626	6.9809	7.0745	7.0745	7.0935	7.0367	6.9809	6.9443	6.9081	
util living area	0.9959	0.9879	0.9606	0.8527	0.6633	0.4615	0.3331	0.3757	0.6215	0.9196	0.9889	0.9970	(86)
MIT	20.2277	20.4026	20.6372	20.8857	20.9814	20.9987	20.9999	20.9998	20.9910	20.8314	20.4866	20.2018	(87)
Th 2	20.1969	20.1991	20.2014	20.2125	20.2148	20.2259	20.2259	20.2282	20.2215	20.2148	20.2103	20.2058	(88)
util rest of house	0.9946	0.9841	0.9487	0.8190	0.6126	0.4062	0.2745	0.3128	0.5555	0.8909	0.9847	0.9960	(89)
MIT 2	19.2983	19.5214	19.8135	20.1070	20.2012	20.2253	20.2259	20.2281	20.2163	20.0578	19.6382	19.2724	(90)
Living area fraction										fLA = Living area / (4) =		0.3225	(91)
MIT	19.5981	19.8056	20.0791	20.3581	20.4528	20.4747	20.4755	20.4770	20.4661	20.3073	19.9118	19.5722	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5981	19.8056	20.0791	20.3581	20.4528	20.4747	20.4755	20.4770	20.4661	20.3073	19.9118	19.5722	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9817	0.9466	0.8256	0.6283	0.4241	0.2934	0.3331	0.5766	0.8947	0.9826	0.9949	(94)
Useful gains	567.7876	653.7989	712.7857	711.4618	582.9651	391.0878	258.3152	270.8502	423.0141	560.3895	552.7598	542.4966	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1061.2536	1030.9178	936.3458	778.1457	592.5948	391.6146	258.3464	270.9246	427.0263	657.2199	872.7484	1053.5718	(97)
Space heating kWh	367.1387	253.4239	166.3287	48.0124	7.1645	0.0000	0.0000	0.0000	0.0000	72.0418	230.3918	380.2400	(98a)
Space heating requirement - total per year (kWh/year)												1524.7418	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	367.1387	253.4239	166.3287	48.0124	7.1645	0.0000	0.0000	0.0000	0.0000	72.0418	230.3918	380.2400	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1524.7418	
Space heating per m2											(98c) / (4) =	19.0236	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	367.1387	253.4239	166.3287	48.0124	7.1645	0.0000	0.0000	0.0000	0.0000	72.0418	230.3918	380.2400	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	367.1387	253.4239	166.3287	48.0124	7.1645	0.0000	0.0000	0.0000	0.0000	72.0418	230.3918	380.2400	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417	(231)
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1524.7418	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	660.0543	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	146.4912	(230a)
Total electricity for the above, kWh/year	146.4912	(231)
Electricity for lighting (calculated in Appendix L)	182.0700	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2513.3574	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1524.7418	0.1575	240.2172	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			333.3931	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			379.9916	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.7400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1524.7418	1.5832	2413.9828	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	1.5220	1004.5938	(278)
Space and water heating			3418.5766	(279)
Pumps, fans and electric keep-hot	146.4912	1.5128	221.6118	(281)
Energy for lighting	182.0700	1.5338	279.2651	(282)
Total Primary energy kWh/year			3919.4535	(286)
Dwelling Primary energy Rate (DPER)			48.9000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		204.3825	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	3 * 10 = 30.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1468	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3968	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3373	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4300	0.4216	0.4132	0.3710	0.3626	0.3204	0.3204	0.3120	0.3373	0.3626	0.3794	0.3963	(22b)
Effective ac	0.5925	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.9800	1.1450	20.5878			(27)
EF UH Corridor			27.5800	0.1300	3.5854			(28b)
Brickwork	43.0200	17.9800	25.0400	0.1800	4.5072			(29a)
Communal Wall	15.1400	2.0600	13.0800	0.1800	2.3544			(29a)
Stairwell Wall	18.4400		18.4400	0.1800	3.3192			(29a)
Lift Shaft Wall	7.7300		7.7300	0.1800	1.3914			(29a)
Total net area of external elements Aum(A, m2)			111.9100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.8054			(33)
Main dwelling								
Party Wall 1			38.9600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 272.8160 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	50.4500	0.0700	3.5315	
E18 Party wall between dwellings	8.6400	0.0600	0.5184	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.0200	0.1620	
E16 Corner (normal)	11.5200	0.0900	1.0368	
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0900	-0.7776	
E25 Staggered party wall between dwellings	5.7600	0.0600	0.3456	
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350	
E4 Jamb	18.6000	0.0500	0.9300	
E5 Ground floor (normal)	24.5000	0.1600	3.9200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1017 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.9071 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.9589	39.7168	39.4794	38.3646	38.1560	37.1851	37.1851	37.0052	37.5591	38.1560	38.5780	39.0191	(38)
Heat transfer coeff	87.8660	87.6239	87.3865	86.2717	86.0631	85.0921	85.0921	84.9123	85.4661	86.0631	86.4851	86.9262	(39)

Average = Sum(39)m / 12 = 86.2707

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0963	1.0932	1.0903	1.0764	1.0738	1.0617	1.0617	1.0594	1.0663	1.0738	1.0790	1.0845	(40)
HLP (average)												1.0764	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)

Hot water usage for mixer showers

65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day) 122.9552 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.4371	228.4904	242.4427	212.2900	205.2316	184.3133	181.3825	188.8798	191.2935	214.0638	228.5663	255.4866	(62)
WWHRS	-29.9719	-26.5074	-27.7571	-22.9839	-21.4202	-18.3294	-17.1809	-18.2702	-18.9643	-22.3568	-25.3276	-29.4169	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.4652	201.9830	214.6857	189.3061	183.8114	165.9839	164.2016	170.6097	172.3292	191.7070	203.2387	226.0697	(64)
									Total per year (kWh/year) = Sum(64)m =			2312.3912	(64)
12Total per year (kWh/year)												2312	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	107.7135	95.6481	102.3953	91.6669	90.0226	82.3646	82.0928	84.5857	84.6855	92.9593	97.0787	106.7324	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8291	122.7036	110.8291	114.5234	110.8291	114.5234	110.8291	110.8291	114.5234	110.8291	114.5234	110.8291	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)													
	144.7762	142.3335	137.6281	127.3151	120.9981	114.3953	110.3398	113.6904	117.6188	124.9453	134.8316	143.4576	(72)
Total internal gains													
	538.3445	550.0568	527.7304	508.8782	483.4244	463.0020	445.5561	446.6264	459.9955	478.8612	507.8843	527.3298	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	17.9800	19.6403	0.6300	0.7000	0.7700	107.9217	(76)

Solar gains	107.9217	211.1178	347.6809	507.0718	621.4356	636.1499	605.6406	520.2364	404.3673	250.5090	134.5657	88.7496	(83)
Total gains	646.2662	761.1745	875.4113	1015.9501	1104.8600	1099.1519	1051.1968	966.8627	864.3627	729.3702	642.4500	616.0793	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.1273	69.3184	69.5067	70.4048	70.5755	71.3808	71.3808	71.5319	71.0684	70.5755	70.2311	69.8747	
alpha	5.6085	5.6212	5.6338	5.6937	5.7050	5.7587	5.7587	5.7688	5.7379	5.7050	5.6821	5.6583	
util living area													
	0.9943	0.9854	0.9579	0.8619	0.6886	0.4910	0.3556	0.4027	0.6561	0.9229	0.9866	0.9956	(86)
MIT	19.9617	20.1678	20.4599	20.7875	20.9499	20.9938	20.9992	20.9984	20.9714	20.7195	20.2824	19.9315	(87)
Th 2	20.0039	20.0064	20.0088	20.0202	20.0223	20.0323	20.0323	20.0341	20.0284	20.0223	20.0180	20.0135	(88)
util rest of house													
	0.9924	0.9806	0.9444	0.8252	0.6279	0.4189	0.2777	0.3189	0.5746	0.8920	0.9812	0.9941	(89)
MIT 2	18.8109	19.0733	19.4367	19.8240	19.9859	20.0293	20.0321	20.0336	20.0121	19.7623	19.2292	18.7797	(90)
Living area fraction									fLA = Living area / (4) =			0.3225	(91)
MIT	19.1820	19.4263	19.7667	20.1347	20.2968	20.3404	20.3440	20.3448	20.3215	20.0710	19.5689	19.1512	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1820	19.4263	19.7667	20.1347	20.2968	20.3404	20.3440	20.3448	20.3215	20.0710	19.5689	19.1512	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9902	0.9769	0.9404	0.8299	0.6456	0.4421	0.3028	0.3459	0.6000	0.8938	0.9780	0.9922	(94)
Useful gains	639.9289	743.5871	823.2778	843.1091	713.2502	485.9083	318.3534	334.4783	518.6349	651.9085	628.3157	611.3013	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1307.6257	1272.8479	1159.3325	969.2398	739.8664	488.4612	318.5830	334.9623	531.7263	815.1070	1078.3713	1299.6529	(97)
Space heating kWh													
	496.7664	355.6633	250.0247	90.8142	19.8024	0.0000	0.0000	0.0000	0.0000	121.4197	324.0400	512.1336	(98a)
Space heating requirement - total per year (kWh/year)												2170.6642	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	496.7664	355.6633	250.0247	90.8142	19.8024	0.0000	0.0000	0.0000	0.0000	121.4197	324.0400	512.1336	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2170.6642	
Space heating per m2										(98c) / (4) =		27.0825	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	496.7664	355.6633	250.0247	90.8142	19.8024	0.0000	0.0000	0.0000	0.0000	121.4197	324.0400	512.1336	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	538.2085	385.3340	270.8826	98.3902	21.4544	0.0000	0.0000	0.0000	0.0000	131.5489	351.0726	554.8576	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	228.4652	201.9830	214.6857	189.3061	183.8114	165.9839	164.2016	170.6097	172.3292	191.7070	203.2387	226.0697	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7533	85.3149	84.4024	82.5111	80.5944	79.8000	79.8000	79.8000	79.8000	83.0645	85.1005	85.8354	(217)
Fuel for water heating, kWh/month													
	266.4216	236.7501	254.3597	229.4310	228.0696	207.9998	205.7664	213.7966	215.9514	230.7930	238.8219	263.3760	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.0281	18.4740	16.6338	12.1866	9.4133	7.6907	8.5871	11.1619	14.4982	19.0224	21.4857	23.6681	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3577	-31.5802	-47.5826	-56.1624	-62.8907	-59.5473	-58.8114	-54.3583	-46.9199	-37.2652	-23.9936	-18.2969	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9812	-17.1319	-34.6992	-53.0827	-71.1471	-71.8453	-71.0093	-59.6908	-43.1804	-24.8245	-10.7585	-6.2867	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2351.7489	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2791.5370	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	185.8499	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-990.4037	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4424.7321	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2351.7489	0.2100	493.8673	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2791.5370	0.2100	586.2228	(264)
Space and water heating			1080.0900	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	185.8499	0.1443	26.8239	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.7662	0.1336	-69.3067	
PV Unit electricity exported	-471.6375	0.1254	-59.1233	
Total			-128.4300	(269)
Total CO2, kg/year			990.4132	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2351.7489	1.1300	2657.4762	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2791.5370	1.1300	3154.4368	(278)
Space and water heating			5811.9131	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	185.8499	1.5338	285.0627	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.7662	1.4937	-774.8827	
PV Unit electricity exported	-471.6375	0.4601	-217.0111	
Total			-991.8938	(283)
Total Primary energy kWh/year			5235.1828	(286)
Target Primary Energy Rate (TPER)			65.3200	(287)

Full SAP Calculation Printout

Plot Reference	P-23	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-23
Plot Address	Flat 3, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	4.74	**TER**	12.36
Environmental	96 A	**% DER < TER**			61.65
CO_2 Emissions (t/year)	0.3	**DFEE**	35.72	**TFEE**	34.89
Compliance Check	See BREL	**% DFEE < TFEE**			-2.38
% DPER < TPER	25.14	**DPER**	48.90	**TPER**	65.32

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	204.3825	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9100 (17)
Infiltration rate		0.1455 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1237 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1577	0.1546	0.1515	0.1360	0.1330	0.1175	0.1175	0.1144	0.1237	0.1330	0.1391	0.1453	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

Effective ac	0.2937	0.2906	0.2875	0.2720	0.2690	0.2535	0.2535	0.2504	0.2597	0.2690	0.2751	0.2813	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
EF UH Corridor			27.5800	0.1400	3.8612	110.0000	3033.8000	(28b)
Brickwork	43.0200	18.4300	24.5900	0.2100	5.1639	110.0000	2704.9001	(29a)
Communal Wall	15.1400	2.0600	13.0800	0.2200	2.8776	110.0000	1438.8000	(29a)
Stairwell Wall	18.4400		18.4400	0.2200	4.0568	110.0000	2028.4001	(29a)
Lift Shaft Wall	7.7300		7.7300	0.0000	0.0000	110.0000	850.3000	(29a)
Total net area of external elements Aum(A, m2)			104.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.2062			(33)
Main dwelling								
Party Wall 1			38.9600	0.0000	0.0000	110.0000	4285.5999	(32)
Party Floor 1			52.5700			70.0000	3679.9000	(32d)
Party Ceiling 1			80.1500			30.0000	2404.5000	(32b)
Internal Wall 1			160.0000			9.0000	1440.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21866.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 272.8160 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	50.4500	0.0380	1.9171
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3576 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.5638 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8080	19.5995	19.3909	18.3482	18.1397	17.0970	17.0970	16.8885	17.5141	18.1397	18.5568	18.9738	(38)
Heat transfer coeff	69.3718	69.1632	68.9547	67.9120	67.7035	66.6608	66.6608	66.4523	67.0779	67.7035	68.1206	68.5376	(39)
Average = Sum(39)m / 12 =												67.8599	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8655	0.8629	0.8603	0.8473	0.8447	0.8317	0.8317	0.8291	0.8369	0.8447	0.8499	0.8551	(40)
HLP (average)												0.8467	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)
Hot water usage for mixer showers

65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day) 122.9552 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)

Total per year (kWh/year) = Sum(64)m = 2387.1855 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.7739	22.8921	18.6171	14.0944	10.5357	8.8947	9.6110	12.4928	16.7678	21.2906	24.8492	26.4902	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.9907	331.3942	322.8174	304.5586	281.5100	259.8476	245.3758	241.9722	250.5490	268.8079	291.8565	313.5189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains	550.0126	548.0918	530.5346	497.4399	464.5157	434.6094	416.7985	419.6273	436.4075	466.5157	503.0091	534.9386	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	19.6403	0.3100	0.0000	0.7700	86.4023	(76)

Solar gains	86.4023	169.0211	278.3537	405.9623	497.5221	509.3024	484.8766	416.5019	323.7369	200.5578	107.7335	71.0530	(83)
Total gains	636.4149	717.1129	808.8884	903.4023	962.0378	943.9118	901.6751	836.1292	760.1444	667.0735	610.7426	605.9916	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	87.5564	87.8204	88.0860	89.4384	89.7139	91.1172	91.1172	91.4031	90.5506	89.7139	89.1646	88.6220	
alpha	6.8371	6.8547	6.8724	6.9626	6.9809	7.0745	7.0745	7.0935	7.0367	6.9809	6.9443	6.9081	
util living area	0.9924	0.9820	0.9452	0.8293	0.6423	0.4511	0.3252	0.3654	0.6015	0.8970	0.9826	0.9943	(86)
MIT	20.3093	20.4632	20.6913	20.9047	20.9846	20.9989	20.9999	20.9998	20.9926	20.8609	20.5442	20.2792	(87)
Th 2	20.1969	20.1991	20.2014	20.2125	20.2148	20.2259	20.2259	20.2282	20.2215	20.2148	20.2103	20.2058	(88)
util rest of house	0.9900	0.9765	0.9299	0.7936	0.5924	0.3970	0.2680	0.3042	0.5369	0.8637	0.9763	0.9925	(89)
MIT 2	19.4017	19.5969	19.8771	20.1259	20.2036	20.2254	20.2259	20.2281	20.2172	20.0885	19.7096	19.3708	(90)
Living area fraction									fLA = Living area / (4) =			0.3225	(91)
MIT	19.6945	19.8763	20.1397	20.3771	20.4555	20.4749	20.4755	20.4770	20.4673	20.3376	19.9788	19.6637	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6945	19.8763	20.1397	20.3771	20.4555	20.4749	20.4755	20.4770	20.4673	20.3376	19.9788	19.6637	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9881	0.9738	0.9285	0.8015	0.6079	0.4144	0.2865	0.3240	0.5576	0.8695	0.9740	0.9909	(94)
Useful gains	628.8159	698.3231	751.0798	724.0658	584.8701	391.1679	258.3203	270.8643	423.8350	580.0176	594.8436	600.4675	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1067.9411	1035.8097	940.5197	779.4322	592.7797	391.6225	258.3469	270.9261	427.1058	659.2712	877.3089	1059.8488	(97)
Space heating kWh	326.7092	226.7909	140.9433	39.8638	5.8848	0.0000	0.0000	0.0000	0.0000	58.9647	203.3751	341.7797	(98a)
Space heating requirement - total per year (kWh/year)												1344.3113	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	326.7092	226.7909	140.9433	39.8638	5.8848	0.0000	0.0000	0.0000	0.0000	58.9647	203.3751	341.7797	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1344.3113	
Space heating per m2											(98c) / (4) =	16.7724	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	326.7092	226.7909	140.9433	39.8638	5.8848	0.0000	0.0000	0.0000	0.0000	58.9647	203.3751	341.7797	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	326.7092	226.7909	140.9433	39.8638	5.8848	0.0000	0.0000	0.0000	0.0000	58.9647	203.3751	341.7797	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417	(231)
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1344.3113	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												660.0543	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	146.4912	(230a)
Total electricity for the above, kWh/year	146.4912	(231)
Electricity for lighting (calculated in Appendix L)	182.0700	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2332.9268	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1344.3113	16.4900	221.6769	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	16.4900	108.8430	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	146.4912	16.4900	24.1564	(249)
Energy for lighting	182.0700	16.4900	30.0234	(250)
Additional standing charges			0.0000	(251)
Total energy cost			384.6996	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1066	(257)
SAP value		82.0619	
SAP rating (Section 12)		82	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1344.3113	0.1577	212.0207	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			305.1966	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			351.7951	(272)
CO2 emissions per m2			4.3900	(273)
EI value			96.2333	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b) x	2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 80.1500						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	204.3825	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	2.9100	(17)
Infiltration rate	0.1455	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1237	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1330	0.1268	0.1268	0.1175	0.1206	0.1051	0.1051	0.1020	0.1051	0.1175	0.1144	0.1237	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2690	0.2628	0.2628	0.2535	0.2566	0.2411	0.2411	0.2380	0.2411	0.2535	0.2504	0.2597	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
EF UH Corridor			27.5800	0.1400	3.8612	110.0000	3033.8000	(28b)
Brickwork	43.0200	18.4300	24.5900	0.2100	5.1639	110.0000	2704.9001	(29a)
Communal Wall	15.1400	2.0600	13.0800	0.2200	2.8776	110.0000	1438.8000	(29a)
Stairwell Wall	18.4400		18.4400	0.2200	4.0568	110.0000	2028.4001	(29a)
Lift Shaft Wall	7.7300		7.7300	0.0000	0.0000	110.0000	850.3000	(29a)
Total net area of external elements Aum(A, m2)			104.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.2062			(33)
Main dwelling								
Party Wall 1			38.9600	0.0000	0.0000	110.0000	4285.5999	(32)
Party Floor 1			52.5700			70.0000	3679.9000	(32d)
Party Ceiling 1			80.1500			30.0000	2404.5000	(32b)
Internal Wall 1			160.0000			9.0000	1440.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	21866.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	272.8160	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	50.4500	0.0380	1.9171
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3576	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	49.5638	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.1397	17.7226	17.7226	17.0970	17.3056	16.2629	16.2629	16.0544	16.2629	17.0970	16.8885	17.5141	(38)
Heat transfer coeff	67.7035	67.2864	67.2864	66.6608	66.8694	65.8267	65.8267	65.6181	65.8267	66.6608	66.4523	67.0779	(39)
Average = Sum(39)m / 12 =												66.5913	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8447	0.8395	0.8395	0.8317	0.8343	0.8213	0.8213	0.8187	0.8213	0.8317	0.8291	0.8369	(40)
HLP (average)												0.8308	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4657	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day)	122.9552	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867 (64)
Total per year (kWh/year) = Sum(64)m =												2387.1855 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.7739	22.8921	18.6171	14.0944	10.5357	8.8947	9.6110	12.4928	16.7678	21.2906	24.8492	26.4902	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.9907	331.3942	322.8174	304.5586	281.5100	259.8476	245.3758	241.9722	250.5490	268.8079	291.8565	313.5189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)													
	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains													
	550.0126	548.0918	530.5346	497.4399	464.5157	434.6094	416.7985	419.6273	436.4075	466.5157	503.0091	534.9386	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	23.8018	0.3100	0.0000	0.7700	104.7097	(76)

Solar gains	104.7097	178.9135	291.9814	431.1994	513.9280	556.1357	524.3829	462.4564	361.6266	227.7362	128.6109	86.6042	(83)
Total gains	654.7223	727.0053	822.5161	928.6393	978.4437	990.7452	941.1814	882.0837	798.0341	694.2519	631.6201	621.5427	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	89.7139	90.2700	90.2700	91.1172	90.8330	92.2718	92.2718	92.5650	92.2718	91.1172	91.4031	90.5506	
alpha	6.9809	7.0180	7.0180	7.0745	7.0555	7.1515	7.1515	7.1710	7.1515	7.0745	7.0935	7.0367	
util living area													
	0.9876	0.9728	0.9167	0.7582	0.5497	0.3454	0.2308	0.2529	0.4933	0.8324	0.9683	0.9905	(86)
MIT	20.4344	20.5756	20.7879	20.9527	20.9950	20.9999	21.0000	21.0000	20.9983	20.9269	20.6672	20.4060	(87)
Th 2	20.2148	20.2192	20.2192	20.2259	20.2237	20.2349	20.2349	20.2372	20.2349	20.2259	20.2282	20.2215	(88)
util rest of house													
	0.9836	0.9645	0.8951	0.7159	0.4986	0.2946	0.1773	0.1962	0.4312	0.7867	0.9571	0.9874	(89)
MIT 2	19.5743	19.7533	20.0057	20.1862	20.2206	20.2349	20.2349	20.2372	20.2341	20.1659	19.8760	19.5442	(90)
Living area fraction									fLA = Living area / (4) =			0.3225	(91)
MIT	19.8517	20.0185	20.2580	20.4334	20.4703	20.4816	20.4817	20.4832	20.4806	20.4113	20.1311	19.8221	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8517	20.0185	20.2580	20.4334	20.4703	20.4816	20.4817	20.4832	20.4806	20.4113	20.1311	19.8221	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9813	0.9620	0.8963	0.7276	0.5150	0.3110	0.1945	0.2145	0.4512	0.7984	0.9555	0.9854	(94)
Useful gains	642.4732	699.3872	737.1839	675.6964	503.8752	308.1231	183.1068	189.1871	360.0896	554.2861	603.4882	612.4625	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	998.7425	963.4395	865.1675	702.1639	506.2241	308.1733	183.1080	189.1895	360.7670	594.0379	806.1419	987.5298	(97)
Space heating kWh													
	265.0644	177.4432	95.2198	19.0565	1.7476	0.0000	0.0000	0.0000	0.0000	29.5753	145.9107	279.0500	(98a)
Space heating requirement - total per year (kWh/year)												1013.0674	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	265.0644	177.4432	95.2198	19.0565	1.7476	0.0000	0.0000	0.0000	0.0000	29.5753	145.9107	279.0500	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1013.0674	
Space heating per m2											(98c) / (4) =	12.6396	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	265.0644	177.4432	95.2198	19.0565	1.7476	0.0000	0.0000	0.0000	0.0000	29.5753	145.9107	279.0500	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)													
	265.0644	177.4432	95.2198	19.0565	1.7476	0.0000	0.0000	0.0000	0.0000	29.5753	145.9107	279.0500	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417	(231)
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1013.0674	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	660.0543	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	146.4912	(230a)
Total electricity for the above, kWh/year	146.4912	(231)
Electricity for lighting (calculated in Appendix L)	182.0700	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2001.6829	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1013.0674	27.6700	280.3157	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	27.6700	182.6370	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	146.4912	27.6700	40.5341	(249)
Energy for lighting	182.0700	27.6700	50.3788	(250)
Additional standing charges			0.0000	(251)
Total energy cost			553.8657	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1013.0674	0.1586	160.6607	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			253.8366	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			300.4351	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1013.0674	1.5870	1607.7660	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	1.5220	1004.5938	(278)
Space and water heating			2612.3599	(279)
Pumps, fans and electric keep-hot	146.4912	1.5128	221.6118	(281)
Energy for lighting	182.0700	1.5338	279.2651	(282)
Total Primary energy kWh/year			3113.2368	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 82
Current environmental impact rating: A 96

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 82
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£554	£554	£0
Space heating	£321	£321	£0
Water heating	£183	£183	£0
Lighting	£50	£50	£0
Total cost of fuels	£554	£554	£0
Total cost of uses	£554	£554	£0
Delivered energy	25 kWh/m²	25 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	39 kWh/m²	39 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	204.3825	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9100	(17)
Infiltration rate		0.1455	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1237	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1577	0.1546	0.1515	0.1360	0.1330	0.1175	0.1175	0.1144	0.1237	0.1330	0.1391	0.1453	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

Effective ac	0.2937	0.2906	0.2875	0.2720	0.2690	0.2535	0.2535	0.2504	0.2597	0.2690	0.2751	0.2813	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
EF UH Corridor			27.5800	0.1400	3.8612	110.0000	3033.8000	(28b)
Brickwork	43.0200	18.4300	24.5900	0.2100	5.1639	110.0000	2704.9001	(29a)
Communal Wall	15.1400	2.0600	13.0800	0.2200	2.8776	110.0000	1438.8000	(29a)
Stairwell Wall	18.4400		18.4400	0.2200	4.0568	110.0000	2028.4001	(29a)
Lift Shaft Wall	7.7300		7.7300	0.0000	0.0000	110.0000	850.3000	(29a)
Total net area of external elements Aum(A, m2)			104.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.2062			(33)
Main dwelling								
Party Wall 1			38.9600	0.0000	0.0000	110.0000	4285.5999	(32)
Party Floor 1			52.5700			70.0000	3679.9000	(32d)
Party Ceiling 1			80.1500			30.0000	2404.5000	(32b)
Internal Wall 1			160.0000			9.0000	1440.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21866.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	272.8160	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	50.4500	0.0380	1.9171
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3576	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	49.5638	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8080	19.5995	19.3909	18.3482	18.1397	17.0970	17.0970	16.8885	17.5141	18.1397	18.5568	18.9738	(38)
Heat transfer coeff	69.3718	69.1632	68.9547	67.9120	67.7035	66.6608	66.6608	66.4523	67.0779	67.7035	68.1206	68.5376	(39)
Average = Sum(39)m / 12 =												67.8599	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8655	0.8629	0.8603	0.8473	0.8447	0.8317	0.8317	0.8291	0.8369	0.8447	0.8499	0.8551	(40)
HLP (average)												0.8467	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4657	(42)
Hot water usage for mixer showers	65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)
Hot water usage for baths	28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)
Hot water usage for other uses	39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)
Average daily hot water use (litres/day)												122.9552	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
										Total per year (kWh/year) = Sum(64)m =		2387.1855	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	25.7739	22.8921	18.6171	14.0944	10.5357	8.8947	9.6110	12.4928	16.7678	21.2906	24.8492	26.4902 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	327.9907	331.3942	322.8174	304.5586	281.5100	259.8476	245.3758	241.9722	250.5490	268.8079	291.8565	313.5189 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280 (71)
Water heating gains (Table 5)												
	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555 (72)
Total internal gains												
	550.0126	548.0918	530.5346	497.4399	464.5157	434.6094	416.7985	419.6273	436.4075	466.5157	503.0091	534.9386 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	19.6403	0.3100	0.0000	0.7700	86.4023	(76)

Solar gains	86.4023	169.0211	278.3537	405.9623	497.5221	509.3024	484.8766	416.5019	323.7369	200.5578	107.7335	71.0530 (83)
Total gains	636.4149	717.1129	808.8884	903.4023	962.0378	943.9118	901.6751	836.1292	760.1444	667.0735	610.7426	605.9916 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	87.5564	87.8204	88.0860	89.4384	89.7139	91.1172	91.1172	91.4031	90.5506	89.7139	89.1646	88.6220
alpha	6.8371	6.8547	6.8724	6.9626	6.9809	7.0745	7.0745	7.0935	7.0367	6.9809	6.9443	6.9081
util living area												
	0.9924	0.9820	0.9452	0.8293	0.6423	0.4511	0.3252	0.3654	0.6015	0.8970	0.9826	0.9943 (86)
MIT	20.3093	20.4632	20.6913	20.9047	20.9846	20.9989	20.9999	20.9998	20.9926	20.8609	20.5442	20.2792 (87)
Th 2	20.1969	20.1991	20.2014	20.2125	20.2148	20.2259	20.2259	20.2282	20.2215	20.2148	20.2103	20.2058 (88)
util rest of house												
	0.9900	0.9765	0.9299	0.7936	0.5924	0.3970	0.2680	0.3042	0.5369	0.8637	0.9763	0.9925 (89)
MIT 2	19.4017	19.5969	19.8771	20.1259	20.2036	20.2254	20.2259	20.2281	20.2172	20.0885	19.7096	19.3708 (90)
Living area fraction										fLA = Living area / (4) =		0.3225 (91)
MIT	19.6945	19.8763	20.1397	20.3771	20.4555	20.4749	20.4755	20.4770	20.4673	20.3376	19.9788	19.6637 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6945	19.8763	20.1397	20.3771	20.4555	20.4749	20.4755	20.4770	20.4673	20.3376	19.9788	19.6637 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9881	0.9738	0.9285	0.8015	0.6079	0.4144	0.2865	0.3240	0.5576	0.8695	0.9740	0.9909	(94)
Useful gains	628.8159	698.3231	751.0798	724.0658	584.8701	391.1679	258.3203	270.8643	423.8350	580.0176	594.8436	600.4675	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1067.9411	1035.8097	940.5197	779.4322	592.7797	391.6225	258.3469	270.9261	427.1058	659.2712	877.3089	1059.8488	(97)
Space heating kWh	326.7092	226.7909	140.9433	39.8638	5.8848	0.0000	0.0000	0.0000	0.0000	58.9647	203.3751	341.7797	(98a)
Space heating requirement - total per year (kWh/year)												1344.3113	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	326.7092	226.7909	140.9433	39.8638	5.8848	0.0000	0.0000	0.0000	0.0000	58.9647	203.3751	341.7797	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1344.3113	
Space heating per m2											(98c) / (4) =	16.7724	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	326.7092	226.7909	140.9433	39.8638	5.8848	0.0000	0.0000	0.0000	0.0000	58.9647	203.3751	341.7797	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	326.7092	226.7909	140.9433	39.8638	5.8848	0.0000	0.0000	0.0000	0.0000	58.9647	203.3751	341.7797	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417	(231)
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1344.3113	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	660.0543	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	146.4912	(230a)
Total electricity for the above, kWh/year	146.4912	(231)
Electricity for lighting (calculated in Appendix L)	182.0700	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2332.9268	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1344.3113	16.4900	221.6769	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	16.4900	108.8430	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	146.4912	16.4900	24.1564	(249)
Energy for lighting	182.0700	16.4900	30.0234	(250)
Additional standing charges			0.0000	(251)
Total energy cost			384.6996	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1066	(257)
SAP value		82.0619	
SAP rating (Section 12)		82	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1344.3113	0.1577	212.0207	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			305.1966	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			351.7951	(272)
CO2 emissions per m2			4.3900	(273)
EI value			96.2333	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 80.1500 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.3825 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9100	(17)
Infiltration rate		0.1455	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1237	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1330	0.1268	0.1268	0.1175	0.1206	0.1051	0.1051	0.1020	0.1051	0.1175	0.1144	0.1237	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2690	0.2628	0.2628	0.2535	0.2566	0.2411	0.2411	0.2380	0.2411	0.2535	0.2504	0.2597	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Flat Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
EF UH Corridor			27.5800	0.1400	3.8612	110.0000	3033.8000	(28b)
Brickwork	43.0200	18.4300	24.5900	0.2100	5.1639	110.0000	2704.9001	(29a)
Communal Wall	15.1400	2.0600	13.0800	0.2200	2.8776	110.0000	1438.8000	(29a)
Stairwell Wall	18.4400		18.4400	0.2200	4.0568	110.0000	2028.4001	(29a)
Lift Shaft Wall	7.7300		7.7300	0.0000	0.0000	110.0000	850.3000	(29a)
Total net area of external elements Aum(A, m2)			104.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.2062			(33)
Main dwelling								
Party Wall 1			38.9600	0.0000	0.0000	110.0000	4285.5999	(32)
Party Floor 1			52.5700			70.0000	3679.9000	(32d)
Party Ceiling 1			80.1500			30.0000	2404.5000	(32b)
Internal Wall 1			160.0000			9.0000	1440.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21866.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	272.8160	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	50.4500	0.0380	1.9171
E18 Party wall between dwellings	8.6400	0.0380	0.3283
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	11.5200	0.0540	0.6221
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E25 Staggered party wall between dwellings	5.7600	0.0310	0.1786
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.6000	0.0160	0.2976
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3576	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	49.5638	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.1397	17.7226	17.7226	17.0970	17.3056	16.2629	16.2629	16.0544	16.2629	17.0970	16.8885	17.5141	(38)
Heat transfer coeff	67.7035	67.2864	67.2864	66.6608	66.8694	65.8267	65.8267	65.6181	65.8267	66.6608	66.4523	67.0779	(39)
Average = Sum(39)m / 12 =												66.5913	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8447	0.8395	0.8395	0.8317	0.8343	0.8213	0.8213	0.8187	0.8213	0.8317	0.8291	0.8369	(40)
HLP (average)												0.8308	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4657	(42)

Hot water usage for mixer showers

	65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)

Hot water usage for baths

	28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

	39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)
Average daily hot water use (litres/day)												122.9552	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
										Total per year (kWh/year) = Sum(64)m =		2387.1855	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.7739	22.8921	18.6171	14.0944	10.5357	8.8947	9.6110	12.4928	16.7678	21.2906	24.8492	26.4902	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.9907	331.3942	322.8174	304.5586	281.5100	259.8476	245.3758	241.9722	250.5490	268.8079	291.8565	313.5189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains	550.0126	548.0918	530.5346	497.4399	464.5157	434.6094	416.7985	419.6273	436.4075	466.5157	503.0091	534.9386	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	23.8018	0.3100	0.0000	0.7700	104.7097	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	104.7097	178.9135	291.9814	431.1994	513.9280	556.1357	524.3829	462.4564	361.6266	227.7362	128.6109	86.6042	(83)
Total gains	654.7223	727.0053	822.5161	928.6393	978.4437	990.7452	941.1814	882.0837	798.0341	694.2519	631.6201	621.5427	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	89.7139	90.2700	90.2700	91.1172	90.8330	92.2718	92.2718	92.5650	92.2718	91.1172	91.4031	90.5506	
alpha	6.9809	7.0180	7.0180	7.0745	7.0555	7.1515	7.1515	7.1710	7.1515	7.0745	7.0935	7.0367	
util living area	0.9876	0.9728	0.9167	0.7582	0.5497	0.3454	0.2308	0.2529	0.4933	0.8324	0.9683	0.9905	(86)
MIT	20.4344	20.5756	20.7879	20.9527	20.9950	20.9999	21.0000	21.0000	20.9983	20.9269	20.6672	20.4060	(87)
Th 2	20.2148	20.2192	20.2192	20.2259	20.2237	20.2349	20.2349	20.2372	20.2349	20.2259	20.2282	20.2215	(88)
util rest of house	0.9836	0.9645	0.8951	0.7159	0.4986	0.2946	0.1773	0.1962	0.4312	0.7867	0.9571	0.9874	(89)
MIT 2	19.5743	19.7533	20.0057	20.1862	20.2206	20.2349	20.2349	20.2372	20.2341	20.1659	19.8760	19.5442	(90)
Living area fraction										fLA = Living area / (4) =		0.3225	(91)
MIT	19.8517	20.0185	20.2580	20.4334	20.4703	20.4816	20.4817	20.4832	20.4806	20.4113	20.1311	19.8221	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8517	20.0185	20.2580	20.4334	20.4703	20.4816	20.4817	20.4832	20.4806	20.4113	20.1311	19.8221	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9813	0.9620	0.8963	0.7276	0.5150	0.3110	0.1945	0.2145	0.4512	0.7984	0.9555	0.9854	(94)
Useful gains	642.4732	699.3872	737.1839	675.6964	503.8752	308.1231	183.1068	189.1871	360.0896	554.2861	603.4882	612.4625	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	998.7425	963.4395	865.1675	702.1639	506.2241	308.1733	183.1080	189.1895	360.7670	594.0379	806.1419	987.5298	(97)
Space heating kWh	265.0644	177.4432	95.2198	19.0565	1.7476	0.0000	0.0000	0.0000	0.0000	29.5753	145.9107	279.0500	(98a)
Space heating requirement - total per year (kWh/year)												1013.0674	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

265.0644	177.4432	95.2198	19.0565	1.7476	0.0000	0.0000	0.0000	0.0000	29.5753	145.9107	279.0500	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1013.0674

Space heating per m2 (98c) / (4) = 12.6396 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	265.0644	177.4432	95.2198	19.0565	1.7476	0.0000	0.0000	0.0000	0.0000	29.5753	145.9107	279.0500	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	265.0644	177.4432	95.2198	19.0565	1.7476	0.0000	0.0000	0.0000	0.0000	29.5753	145.9107	279.0500	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417	(231)
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1013.0674 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 660.0543 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 146.4912 (230a)
Total electricity for the above, kWh/year 146.4912 (231)
Electricity for lighting (calculated in Appendix L) 182.0700 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2001.6829 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1013.0674	27.6700	280.3157	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	27.6700	182.6370	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	146.4912	27.6700	40.5341	(249)
Energy for lighting	182.0700	27.6700	50.3788	(250)
Additional standing charges			0.0000	(251)
Total energy cost			553.8657	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1013.0674	0.1586	160.6607	(261)

Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			253.8366	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			300.4351	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1013.0674	1.5870	1607.7660	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	1.5220	1004.5938	(278)
Space and water heating			2612.3599	(279)
Pumps, fans and electric keep-hot	146.4912	1.5128	221.6118	(281)
Energy for lighting	182.0700	1.5338	279.2651	(282)
Total Primary energy kWh/year			3113.2368	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-24	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-24
Plot Address	Flat 4, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	85 B	**DER**	3.75	**TER**	10.51
Environmental	97 A	**% DER < TER**			64.32
CO_2 Emissions (t/year)	0.3	**DFEE**	30.42	**TFEE**	30.93
Compliance Check	See BREL	**% DFEE < TFEE**			1.67
% DPER < TPER	29.87	**DPER**	38.75	**TPER**	55.25

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	242.86	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	34.19 m	100.84 m²	2.55 m

8.0 Living Area	36.39	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	84.35	63.66	0.00	None	20.69	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.52	4.46	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	7.61	7.61	0.00	None	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	38.30	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	207.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	100.84

11.1 Party Floors

Summary for Input Data

elmhurst energy

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	100.84

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	North	2.06	
Patio Door	Window-Red	Brickwork	South	2.46	
East	Window-Red	Brickwork	East	4.91	
West	Window	Brickwork	West	4.34	
South East	Window-Red	Brickwork	South East	6.80	
North East	Window-Red	Brickwork	North East	2.18	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging — Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	73.81	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	14.40	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.76	-0.10	-0.10	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	26.60	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	9.63	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	37.69	0.02	0.02	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	1.57	0.33	0.33	Abbey Calculated	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No

Y-value: 0.08 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	2
Manufacturer SFP	0.49
Duct Type	Rigid
MVHR Efficiency	90.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0

Summary for Input Data

Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.53	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	9
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

Summary for Input Data

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-24	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-24
Plot Address	Flat 4, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	85 B	**DER**	3.75	**TER**	10.51
Environmental	97 A	**% DER < TER**			64.32
CO_2 Emissions (t/year)	0.3	**DFEE**	30.42	**TFEE**	30.93
Compliance Check	See BREL	**% DFEE < TFEE**			1.67
% DPER < TPER	29.87	**DPER**	38.75	**TPER**	55.25

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.8400	(1b)	x 2.5500	(2b) =	257.1420	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	257.1420	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5300	(17)
Infiltration rate		0.1265	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1075	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1371	0.1344	0.1317	0.1183	0.1156	0.1021	0.1021	0.0995	0.1075	0.1156	0.1210	0.1263	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2771	0.2744	0.2717	0.2583	0.2556	0.2421	0.2421	0.2395	0.2475	0.2556	0.2610	0.2663	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			16.3500	1.2357	20.2044			(27)
Brickwork	84.3500	20.6900	63.6600	0.2100	13.3686	110.0000	7002.5998	(29a)
Communal Wall	6.5200	2.0600	4.4600	0.2200	0.9812	110.0000	490.6000	(29a)
Stairwell Wall	7.6100		7.6100	0.2500	1.9025	110.0000	837.1000	(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.8981			(33)
Main dwelling								
Party Wall 1			38.3000	0.0000	0.0000	110.0000	4212.9999	(32)
Party Floor 1			100.8400			70.0000	7058.8000	(32d)
Party Ceiling 1			100.8400			30.0000	3025.2000	(32b)
Internal Wall 1			207.0000			9.0000	1863.0000	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			24490.2998	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.8630 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.8100	0.0380	2.8048
E16 Corner (normal)	14.4000	0.0540	0.7776
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	37.6900	0.0160	0.6030
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	1.5700	0.3300	0.5181
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4587 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 51.3568 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.5134	23.2853	23.0571	21.9166	21.6885	20.5480	20.5480	20.3199	21.0042	21.6885	22.1447	22.6009	(38)
Heat transfer coeff	74.8701	74.6420	74.4139	73.2734	73.0453	71.9048	71.9048	71.6767	72.3610	73.0453	73.5015	73.9577	(39)
Average = Sum(39)m / 12 =												73.2164	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7425	0.7402	0.7379	0.7266	0.7244	0.7131	0.7131	0.7108	0.7176	0.7244	0.7289	0.7334	(40)
HLP (average)												0.7261	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7472 (42)

Hot water usage for mixer showers

70.2807	69.2246	67.6855	64.7408	62.5676	60.1442	58.7667	60.2941	61.9684	64.5705	67.5785	70.0115	(42a)

Hot water usage for baths

30.3462	29.8956	29.2609	28.0907	27.2145	26.2429	25.7181	26.3483	27.0345	28.0741	29.2684	30.2437	(42b)

Hot water usage for other uses

42.7637	41.2087	39.6536	38.0986	36.5436	34.9885	34.9885	36.5436	38.0986	39.6536	41.2087	42.7637	(42c)

Average daily hot water use (litres/day) 131.8084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.3907	140.3288	136.6000	130.9301	126.3257	121.3756	119.4733	123.1860	127.1015	132.2983	138.0556	143.0189	(44)
Energy conte	227.0959	199.8264	209.9492	179.2367	170.0586	149.2454	144.4926	152.5299	156.7289	179.5275	196.6855	223.9330	(45)
Energy content (annual)										Total = Sum(45)m =		2189.3096	
Distribution loss (46)m = 0.15 x (45)m	34.0644	29.9740	31.4924	26.8855	25.5088	22.3868	21.6739	22.8795	23.5093	26.9291	29.5028	33.5899	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(64)
										Total per year (kWh/year) = Sum(64)m =		2534.2346	(64)
12Total per year (kWh/year)												2534	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	75.5094	66.4423	69.8081	59.5962	56.5445	49.6241	48.0438	50.7162	52.1124	59.6929	65.3979	74.4577	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.5645	144.5536	130.5645	134.9167	130.5645	134.9167	130.5645	130.5645	134.9167	130.5645	134.9167	130.5645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.6786	260.3525	253.6144	239.2697	221.1621	204.1435	192.7740	190.1001	196.8383	211.1830	229.2906	246.3092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	(71)
Water heating gains (Table 5)	101.4911	98.8724	93.8281	82.7725	76.0007	68.9224	64.5750	68.1669	72.3783	80.2324	90.8305	100.0776	(72)
Total internal gains	553.9418	567.9860	542.2145	521.1664	491.9348	472.1901	452.1210	453.0391	468.3407	486.1874	519.2452	541.1588	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	19.6403	0.3300	0.0000	0.7700	21.6592	(80)
Northeast	2.1800	11.2829	0.3100	0.0000	0.7700	5.8713	(75)
East	4.9100	19.6403	0.3100	0.0000	0.7700	23.0187	(76)

Southeast			6.8000		36.7938		0.3100		0.0000		0.7700		59.7223 (77)
South			2.4600		46.7521		0.3100		0.0000		0.7700		27.4529 (78)
Solar gains	137.7243	246.0405	361.9288	482.4750	565.4239	570.7220	546.4495	484.1990	404.1799	279.2388	167.1702	116.3673 (83)	
Total gains	691.6661	814.0265	904.1433	1003.6414	1057.3586	1042.9121	998.5705	937.2381	872.5206	765.4262	686.4154	657.5261 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	90.8621	91.1398	91.4192	92.8422	93.1321	94.6093	94.6093	94.9104	94.0128	93.1321	92.5540	91.9831	
alpha	7.0575	7.0760	7.0946	7.1895	7.2088	7.3073	7.3073	7.3274	7.2675	7.2088	7.1703	7.1322	
util living area	0.9931	0.9786	0.9393	0.8172	0.6328	0.4406	0.3168	0.3517	0.5680	0.8748	0.9803	0.9949 (86)	
MIT	20.3368	20.5229	20.7293	20.9215	20.9879	20.9992	20.9999	20.9999	20.9956	20.8936	20.5884	20.3063 (87)	
Th 2	20.3035	20.3055	20.3074	20.3174	20.3194	20.3293	20.3293	20.3313	20.3253	20.3194	20.3154	20.3114 (88)	
util rest of house	0.9911	0.9730	0.9249	0.7852	0.5896	0.3947	0.2685	0.3006	0.5142	0.8427	0.9742	0.9935 (89)	
MIT 2	19.5292	19.7648	20.0183	20.2438	20.3100	20.3289	20.3293	20.3313	20.3226	20.2209	19.8570	19.4969 (90)	
Living area fraction									fLA = Living area / (4) =			0.3609 (91)	
MIT	19.8207	20.0384	20.2749	20.4884	20.5546	20.5708	20.5713	20.5725	20.5655	20.4637	20.1209	19.7890 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.8207	20.0384	20.2749	20.4884	20.5546	20.5708	20.5713	20.5725	20.5655	20.4637	20.1209	19.7890 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9894	0.9704	0.9241	0.7935	0.6047	0.4113	0.2859	0.3191	0.5335	0.8500	0.9721	0.9921 (94)	
Useful gains	684.3615	789.9689	835.5214	796.4214	639.3954	428.9429	285.5344	299.0269	465.4931	650.6296	667.2404	652.3245 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	1162.0359	1129.9580	1025.0436	849.1197	646.7896	429.3284	285.5561	299.0741	467.8473	720.4967	957.0579	1152.9279 (97)	
Space heating kWh	355.3898	228.4727	141.0045	37.9428	5.5013	0.0000	0.0000	0.0000	0.0000	51.9811	208.6686	372.4489 (98a)	
Space heating requirement - total per year (kWh/year)												1401.4098	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	355.3898	228.4727	141.0045	37.9428	5.5013	0.0000	0.0000	0.0000	0.0000	51.9811	208.6686	372.4489 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1401.4098	
Space heating per m2											(98c) / (4) =	13.8974 (99)	

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	355.3898	228.4727	141.0045	37.9428	5.5013	0.0000	0.0000	0.0000	0.0000	51.9811	208.6686	372.4489 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	355.3898	228.4727	141.0045	37.9428	5.5013	0.0000	0.0000	0.0000	0.0000	51.9811	208.6686	372.4489 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280 (64)	
Efficiency of water heater												361.6650 (216)	
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)	
Fuel for water heating, kWh/month	70.8918	62.5679	66.1508	57.3975	55.1211	49.1050	48.0521	50.2744	51.1741	57.7392	62.2221	70.0173 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	16.3195	14.7402	16.3195	15.7931	16.3195	15.7931	16.3195	16.3195	15.7931	16.3195	15.7931	16.3195 (231)	
Lighting	26.5742	21.3188	19.1952	14.0633	10.8629	8.8751	9.9095	12.8807	16.7308	21.9517	24.7944	27.3128 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												1401.4098 (211)	
Space heating fuel - main system 2												0.0000 (213)	

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	700.7133	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	192.1493	(230a)
Total electricity for the above, kWh/year	192.1493	(231)
Electricity for lighting (calculated in Appendix L)	214.4693	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2508.7416	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1401.4098	0.1581	221.4974	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	700.7133	0.1412	98.9324	(264)
Space and water heating			320.4298	(265)
Pumps, fans and electric keep-hot	192.1493	0.1387	26.6535	(267)
Energy for lighting	214.4693	0.1443	30.9545	(268)
Total CO2, kg/year			378.0378	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1401.4098	1.5851	2221.3128	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	700.7133	1.5221	1066.5393	(278)
Space and water heating			3287.8521	(279)
Pumps, fans and electric keep-hot	192.1493	1.5128	290.6835	(281)
Energy for lighting	214.4693	1.5338	328.9601	(282)
Total Primary energy kWh/year			3907.4958	(286)
Dwelling Primary energy Rate (DPER)			38.7500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.8400	(1b) x	2.5500	(2b) =	257.1420	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		257.1420	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1556	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4056	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3447	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4395	0.4309	0.4223	0.3792	0.3706	0.3275	0.3275	0.3189	0.3447	0.3706	0.3878	0.4050	(22b)
Effective ac	0.5966	0.5928	0.5892	0.5719	0.5687	0.5536	0.5536	0.5508	0.5594	0.5687	0.5752	0.5820	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.6900	1.1450	23.6908			(27)
Brickwork	84.3500	20.6900	63.6600	0.1800	11.4588			(29a)
Communal Wall	6.5200	2.0600	4.4600	0.1800	0.8028			(29a)
Stairwell Wall	7.6100		7.6100	0.1800	1.3698			(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.3822			(33)
Main dwelling								
Party Wall 1			38.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.8630 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.8100	0.0700	5.1667
E16 Corner (normal)	14.4000	0.0900	1.2960
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	37.6900	0.0500	1.8845
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	1.5700	0.0200	0.0314
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.4327 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 51.8149 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	50.6247	50.3064	49.9945	48.5292	48.2550	46.9788	46.9788	46.7424	47.4704	48.2550	48.8096	49.3894	(38)
Heat transfer coeff	102.4397	102.1214	101.8094	100.3441	100.0699	98.7937	98.7937	98.5574	99.2853	100.0699	100.6246	101.2044	(39)

Average = Sum(39)m / 12 = 100.3428

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0159	1.0127	1.0096	0.9951	0.9924	0.9797	0.9797	0.9774	0.9846	0.9924	0.9979	1.0036	(40)
HLP (average)												0.9951	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7472 (42)

Hot water usage for mixer showers

70.2807	69.2246	67.6855	64.7408	62.5676	60.1442	58.7667	60.2941	61.9684	64.5705	67.5785	70.0115	(42a)

Hot water usage for baths

30.3462	29.8956	29.2609	28.0907	27.2145	26.2429	25.7181	26.3483	27.0345	28.0741	29.2684	30.2437	(42b)

Hot water usage for other uses

42.7637	41.2087	39.6536	38.0986	36.5436	34.9885	34.9885	36.5436	38.0986	39.6536	41.2087	42.7637	(42c)

Average daily hot water use (litres/day) 131.8084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.3907	140.3288	136.6000	130.9301	126.3257	121.3756	119.4733	123.1860	127.1015	132.2983	138.0556	143.0189	(44)
Energy conte	227.0959	199.8264	209.9492	179.2367	170.0586	149.2454	144.4926	152.5299	156.7289	179.5275	196.6855	223.9330	(45)
Energy content (annual)										Total = Sum(45)m =		2189.3096	
Distribution loss (46)m = 0.15 x (45)m	34.0644	29.9740	31.4924	26.8855	25.5088	22.3868	21.6739	22.8795	23.5093	26.9291	29.5028	33.5899	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.6908	241.9121	256.5441	224.3286	216.6535	194.3373	191.0875	199.1248	201.8207	226.1224	241.7773	270.5279	(62)
WWHRS	-32.1294	-28.4155	-29.7551	-24.6384	-22.9621	-19.6488	-18.4177	-19.5853	-20.3294	-23.9662	-27.1508	-31.5344	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.5613	213.4966	226.7890	199.6902	193.6914	174.6884	172.6698	179.5395	181.4913	202.1562	214.6266	238.9934	(64)
										Total per year (kWh/year) = Sum(64)m =		2439.3938	(64)
12Total per year (kWh/year)												2439	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	112.7853	100.1108	107.0840	95.6697	93.8204	85.6976	85.3197	87.9921	88.1858	96.9688	101.4714	111.7336	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.5645	144.5536	130.5645	134.9167	130.5645	134.9167	130.5645	130.5645	134.9167	130.5645	134.9167	130.5645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.6786	260.3525	253.6144	239.2697	221.1621	204.1435	192.7740	190.1001	196.8383	211.1830	229.2906	246.3092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	(71)
Water heating gains (Table 5)	151.5931	148.9745	143.9301	132.8746	126.1027	119.0244	114.6770	118.2690	122.4803	130.3344	140.9325	150.1796	(72)
Total internal gains	607.0438	621.0881	595.3166	574.2684	545.0368	522.2921	502.2231	503.1412	518.4428	539.2894	572.3473	594.2608	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1800	11.2829	0.6300	0.7000	0.7700	7.5171	(75)
East	4.9100	19.6403	0.6300	0.7000	0.7700	29.4714	(76)
Southeast	6.8000	36.7938	0.6300	0.7000	0.7700	76.4638	(77)
South	2.4600	46.7521	0.6300	0.7000	0.7700	35.1486	(78)
West	4.3400	19.6403	0.6300	0.7000	0.7700	26.0501	(80)

Solar gains	174.6509	311.7235	457.9713	609.8271	714.2474	720.8016	690.2001	611.8293	511.1835	353.6146	211.9362	147.6057	(83)
Total gains	781.6947	932.8115	1053.2878	1184.0955	1259.2842	1243.0937	1192.4231	1114.9705	1029.6263	892.9040	784.2835	741.8665	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.4085	66.6154	66.8196	67.7953	67.9811	68.8593	68.8593	69.0244	68.5183	67.9811	67.6064	67.2190	
alpha	5.4272	5.4410	5.4546	5.5197	5.5321	5.5906	5.5906	5.6016	5.5679	5.5321	5.5071	5.4813	
util living area	0.9922	0.9797	0.9488	0.8570	0.6970	0.5029	0.3637	0.4051	0.6406	0.9038	0.9814	0.9940	(86)
MIT	19.9569	20.1849	20.4674	20.7767	20.9407	20.9919	20.9989	20.9980	20.9714	20.7381	20.2960	19.9235	(87)
Th 2	20.0701	20.0728	20.0753	20.0874	20.0897	20.1003	20.1003	20.1022	20.0962	20.0897	20.0851	20.0803	(88)
util rest of house	0.9899	0.9738	0.9346	0.8232	0.6413	0.4347	0.2898	0.3268	0.5663	0.8717	0.9751	0.9922	(89)
MIT 2	18.8653	19.1546	19.5055	19.8749	20.0437	20.0959	20.0999	20.1016	20.0786	19.8435	19.3068	18.8305	(90)
Living area fraction									fLA = Living area / (4) =			0.3609	(91)
MIT	19.2592	19.5264	19.8526	20.2004	20.3674	20.4193	20.4243	20.4251	20.4008	20.1663	19.6638	19.2250	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2592	19.5264	19.8526	20.2004	20.3674	20.4193	20.4243	20.4251	20.4008	20.1663	19.6638	19.2250	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9696	0.9306	0.8277	0.6589	0.4591	0.3165	0.3551	0.5921	0.8748	0.9713	0.9899	(94)
Useful gains	771.6412	904.4081	980.2352	980.0880	829.7416	570.7360	377.4023	395.9171	609.6561	781.1018	761.8023	734.3602	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1532.4199	1493.6695	1359.4186	1133.9235	867.3485	574.9082	377.8206	396.7005	625.5756	957.2995	1264.2219	1520.5908	(97)
Space heating kWh	566.0194	395.9837	282.1125	110.7616	27.9795	0.0000	0.0000	0.0000	0.0000	131.0911	361.7421	584.9556	(98a)
Space heating requirement - total per year (kWh/year)												2460.6454	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	566.0194	395.9837	282.1125	110.7616	27.9795	0.0000	0.0000	0.0000	0.0000	131.0911	361.7421	584.9556	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2460.6454	
Space heating per m2											(98c) / (4) =	24.4015	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	566.0194	395.9837	282.1125	110.7616	27.9795	0.0000	0.0000	0.0000	0.0000	131.0911	361.7421	584.9556	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	613.2387	429.0181	305.6473	120.0017	30.3137	0.0000	0.0000	0.0000	0.0000	142.0272	391.9200	633.7547	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	241.5613	213.4966	226.7890	199.6902	193.6914	174.6884	172.6698	179.5395	181.4913	202.1562	214.6266	238.9934	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9021	85.4251	84.5504	82.7938	80.8341	79.8000	79.8000	79.8000	79.8000	83.1137	85.2209	85.9871	(217)
Fuel for water heating, kWh/month	281.2054	249.9224	268.2292	241.1898	239.6161	218.9078	216.3782	224.9869	227.4327	243.2286	251.8472	277.9411	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.1287	21.7637	19.5958	14.3567	11.0895	9.0602	10.1162	13.1495	17.0799	22.4097	25.3117	27.8827	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.5142	-39.0135	-58.4928	-68.6772	-76.5728	-72.3621	-71.4477	-66.1877	-57.3690	-45.8615	-29.7138	-22.7343	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-10.3983	-22.2731	-45.0293	-68.7685	-92.0656	-92.9483	-91.8851	-77.3021	-55.9899	-32.2561	-14.0094	-8.1954 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2665.9214	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2940.8855	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	218.9444	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1246.0674	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4665.6839	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2665.9214	0.2100	559.8435	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2940.8855	0.2100	617.5860	(264)
Space and water heating			1177.4294	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	218.9444	0.1443	31.6004	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-634.9465	0.1337	-84.8976	
PV Unit electricity exported	-611.1209	0.1254	-76.6355	
Total			-161.5331	(269)
Total CO2, kg/year			1059.4261	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2665.9214	1.1300	3012.4911	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2940.8855	1.1300	3323.2006	(278)
Space and water heating			6335.6918	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	218.9444	1.5338	335.8242	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-634.9465	1.4941	-948.6822	
PV Unit electricity exported	-611.1209	0.4603	-281.2899	
Total			-1229.9722	(283)
Total Primary energy kWh/year			5571.6446	(286)
Target Primary Energy Rate (TPER)			55.2500	(287)

Full SAP Calculation Printout

Plot Reference	P-24	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-24
Plot Address	Flat 4, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	85 B	**DER**	3.75	**TER**	10.51
Environmental	97 A	**% DER < TER**			64.32
CO_2 Emissions (t/year)	0.3	**DFEE**	30.42	**TFEE**	30.93
Compliance Check	See BREL	**% DFEE < TFEE**			1.67
% DPER < TPER	29.87	**DPER**	38.75	**TPER**	55.25

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.8400	(1b)	x 2.5500	(2b) =	257.1420	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	257.1420	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1556	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5300	(17)
Infiltration rate		0.2821	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3057	0.2997	0.2937	0.2637	0.2577	0.2278	0.2278	0.2218	0.2397	0.2577	0.2697	0.2817	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5467	0.5449	0.5431	0.5348	0.5332	0.5259	0.5259	0.5246	0.5287	0.5332	0.5364	0.5397	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			16.3500	1.2357	20.2044			(27)
Brickwork	84.3500	20.6900	63.6600	0.2100	13.3686	110.0000	7002.5998	(29a)
Communal Wall	6.5200	2.0600	4.4600	0.2200	0.9812	110.0000	490.6000	(29a)
Stairwell Wall	7.6100		7.6100	0.2500	1.9025	110.0000	837.1000	(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.8981			(33)
Main dwelling								
Party Wall 1			38.3000	0.0000	0.0000	110.0000	4212.9999	(32)
Party Floor 1			100.8400			70.0000	7058.8000	(32d)
Party Ceiling 1			100.8400			30.0000	3025.2000	(32b)
Internal Wall 1			207.0000			9.0000	1863.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 24490.2998 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.8630 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	73.8100	0.0380	2.8048	
E16 Corner (normal)	14.4000	0.0540	0.7776	
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.6000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815	
E4 Jamb	37.6900	0.0160	0.6030	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	1.5700	0.3300	0.5181	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4587 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.3568 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.3929	46.2390	46.0881	45.3793	45.2467	44.6294	44.6294	44.5151	44.8672	45.2467	45.5150	45.7954	(38)
Heat transfer coeff	97.7497	97.5957	97.4449	96.7361	96.6035	95.9862	95.9862	95.8719	96.2240	96.6035	96.8717	97.1522	(39)

Average = Sum(39)m / 12 = 96.7355

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9694	0.9678	0.9663	0.9593	0.9580	0.9519	0.9519	0.9507	0.9542	0.9580	0.9606	0.9634	(40)
HLP (average)												0.9593	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7472 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

30.3462	29.8956	29.2609	28.0907	27.2145	26.2429	25.7181	26.3483	27.0345	28.0741	29.2684	30.2437	(42b)

Hot water usage for other uses

42.7637	41.2087	39.6536	38.0986	36.5436	34.9885	34.9885	36.5436	38.0986	39.6536	41.2087	42.7637	(42c)

Average daily hot water use (litres/day) 67.0119 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	73.1100	71.1043	68.9145	66.1893	63.7580	61.2314	60.7066	62.8918	65.1331	67.7278	70.4771	73.0074	(44)
Energy conte	115.7883	101.2515	105.9191	90.6099	85.8306	75.2911	73.4194	77.8732	80.3156	91.9059	100.4076	114.3119	(45)

Energy content (annual) Total = Sum(45)m = 1112.9241

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

98.4201	86.0638	90.0312	77.0184	72.9560	63.9975	62.4064	66.1923	68.2683	78.1201	85.3464	97.1651	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

98.4201	86.0638	90.0312	77.0184	72.9560	63.9975	62.4064	66.1923	68.2683	78.1201	85.3464	97.1651	(64)

Total per year (kWh/year) = Sum(64)m = 945.9855 (64)

12Total per year (kWh/year) 946 (64)

Electric shower(s)

56.2832	50.1488	54.7605	52.2573	53.2379	50.7838	52.4766	53.2379	52.2573	54.7605	53.7308	56.2832	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 640.2177 (64a)

Heat gains from water heating, kWh/month

38.6758	34.0531	36.1979	32.3189	31.5485	28.6953	28.7208	29.8575	30.1314	33.2201	34.7693	38.3621	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.5645	144.5536	130.5645	134.9167	130.5645	134.9167	130.5645	130.5645	134.9167	130.5645	134.9167	130.5645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.6786	260.3525	253.6144	239.2697	221.1621	204.1435	192.7740	190.1001	196.8383	211.1830	229.2906	246.3092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	(71)
Water heating gains (Table 5)	51.9836	50.6743	48.6531	44.8874	42.4039	39.8546	38.6032	40.1311	41.8492	44.6507	48.2907	51.5619	(72)
Total internal gains	504.4343	519.7879	497.0396	483.2813	458.3380	443.1223	426.1492	425.0033	437.8116	450.6057	476.7055	492.6431	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	19.6403	0.3300	0.0000	0.7700	21.6592	(80)
Northeast	2.1800	11.2829	0.3100	0.0000	0.7700	5.8713	(75)
East	4.9100	19.6403	0.3100	0.0000	0.7700	23.0187	(76)
Southeast	6.8000	36.7938	0.3100	0.0000	0.7700	59.7223	(77)
South	2.4600	46.7521	0.3100	0.0000	0.7700	27.4529	(78)

Solar gains	137.7243	246.0405	361.9288	482.4750	565.4239	570.7220	546.4495	484.1990	404.1799	279.2388	167.1702	116.3673	(83)
Total gains	642.1586	765.8284	858.9684	965.7562	1023.7618	1013.8443	972.5987	909.2022	841.9915	729.8445	643.8757	609.0105	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.5947	69.7045	69.8124	70.3239	70.4205	70.8733	70.8733	70.9578	70.6982	70.4205	70.2254	70.0227	
alpha	5.6396	5.6470	5.6542	5.6883	5.6947	5.7249	5.7249	5.7305	5.7132	5.6947	5.6817	5.6682	
util living area	0.9968	0.9911	0.9756	0.9190	0.7899	0.5919	0.4322	0.4811	0.7347	0.9498	0.9921	0.9977	(86)
MIT	19.8832	20.0855	20.3525	20.6809	20.8988	20.9839	20.9977	20.9959	20.9488	20.6486	20.2021	19.8455	(87)
Th 2	20.1089	20.1102	20.1115	20.1174	20.1185	20.1236	20.1236	20.1246	20.1217	20.1185	20.1163	20.1139	(88)
util rest of house	0.9959	0.9883	0.9680	0.8953	0.7383	0.5168	0.3472	0.3916	0.6605	0.9297	0.9891	0.9969	(89)
MIT 2	19.0895	19.2911	19.5542	19.8687	20.0538	20.1166	20.1230	20.1234	20.0954	19.8467	19.4127	19.0560	(90)
Living area fraction									fLA = Living area / (4) =			0.3609	(91)
MIT	19.3759	19.5778	19.8423	20.1618	20.3587	20.4296	20.4387	20.4383	20.4034	20.1361	19.6976	19.3409	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3759	19.5778	19.8423	20.1618	20.3587	20.4296	20.4387	20.4383	20.4034	20.1361	19.6976	19.3409	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9948	0.9862	0.9652	0.8966	0.7533	0.5435	0.3779	0.4240	0.6856	0.9301	0.9873	0.9960	(94)
Useful gains	638.7988	755.2843	829.0990	865.9186	771.1547	551.0559	367.5760	385.4842	577.2611	678.8643	635.7194	606.5954	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1473.6654	1432.4907	1300.1376	1089.4252	836.4639	559.5577	368.4610	387.1577	606.5363	921.2175	1220.3514	1470.9713	(97)
Space heating kWh	621.1408	455.0827	350.4528	160.9247	48.5900	0.0000	0.0000	0.0000	0.0000	180.3108	420.9350	643.0956	(98a)
Space heating requirement - total per year (kWh/year)												2880.5325	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	621.1408	455.0827	350.4528	160.9247	48.5900	0.0000	0.0000	0.0000	0.0000	180.3108	420.9350	643.0956	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2880.5325	
Space heating per m2										(98c) / (4) =		28.5654	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	902.2701	710.2977	728.6262	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9293	0.9678	0.9527	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	838.4476	687.4075	694.1673	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1132.2215	1086.5502	1015.0281	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	211.5172	296.9622	238.7204	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	52.8793	74.2406	59.6801	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												186.8000	(107)
Energy for space heating												28.5654	(99)
Energy for space cooling												1.8524	(108)
Total												30.4178	(109)
Fabric Energy Efficiency (DFEE)												30.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.8400	(1b)	x 2.5500	(2b) =	257.1420	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		257.1420	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

													Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												40.0000 / (5) =	0.1556	(8)
Pressure test													Yes	
Pressure Test Method													Blower Door	
Measured/design AP50													5.0000	(17)
Infiltration rate													0.4056	(18)
Number of sides sheltered													2	(19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3447	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4395	0.4309	0.4223	0.3792	0.3706	0.3275	0.3275	0.3189	0.3447	0.3706	0.3878	0.4050	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5966	0.5928	0.5892	0.5719	0.5687	0.5536	0.5536	0.5508	0.5594	0.5687	0.5752	0.5820	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.6900	1.1450	23.6908			(27)
Brickwork	84.3500	20.6900	63.6600	0.1800	11.4588			(29a)
Communal Wall	6.5200	2.0600	4.4600	0.1800	0.8028			(29a)
Stairwell Wall	7.6100		7.6100	0.1800	1.3698			(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.3822			(33)
Main dwelling								
Party Wall 1			38.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.8630	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.8100	0.0700	5.1667
E16 Corner (normal)	14.4000	0.0900	1.2960
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	37.6900	0.0500	1.8845
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	1.5700	0.0200	0.0314
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.4327	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	51.8149	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	50.6247	50.3064	49.9945	48.5292	48.2550	46.9788	46.9788	46.7424	47.4704	48.2550	48.8096	49.3894	(38)
Heat transfer coeff	102.4397	102.1214	101.8094	100.3441	100.0699	98.7937	98.7937	98.5574	99.2853	100.0699	100.6246	101.2044	(39)
Average = Sum(39)m / 12 =												100.3428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0159	1.0127	1.0096	0.9951	0.9924	0.9797	0.9797	0.9774	0.9846	0.9924	0.9979	1.0036	(40)
HLP (average)												0.9951	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7472	(42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

30.3462	29.8956	29.2609	28.0907	27.2145	26.2429	25.7181	26.3483	27.0345	28.0741	29.2684	30.2437	(42b)

Hot water usage for other uses

42.7637	41.2087	39.6536	38.0986	36.5436	34.9885	34.9885	36.5436	38.0986	39.6536	41.2087	42.7637	(42c)

Average daily hot water use (litres/day)	67.0119	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	73.1100	71.1043	68.9145	66.1893	63.7580	61.2314	60.7066	62.8918	65.1331	67.7278	70.4771	73.0074	(44)
Energy conte	115.7883	101.2515	105.9191	90.6099	85.8306	75.2911	73.4194	77.8732	80.3156	91.9059	100.4076	114.3119	(45)
Energy content (annual)										Total = Sum(45)m =		1112.9241	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

98.4201	86.0638	90.0312	77.0184	72.9560	63.9975	62.4064	66.1923	68.2683	78.1201	85.3464	97.1651	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
98.4201	86.0638	90.0312	77.0184	72.9560	63.9975	62.4064	66.1923	68.2683	78.1201	85.3464	97.1651	(64)
									Total per year (kWh/year) = Sum(64)m =		945.9855	(64)
12Total per year (kWh/year)												946	(64)

Electric shower(s)

56.2832	50.1488	54.7605	52.2573	53.2379	50.7838	52.4766	53.2379	52.2573	54.7605	53.7308	56.2832	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	640.2177	(64a)

Heat gains from water heating, kWh/month

38.6758	34.0531	36.1979	32.3189	31.5485	28.6953	28.7208	29.8575	30.1314	33.2201	34.7693	38.3621	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	130.5645	144.5536	130.5645	134.9167	130.5645	134.9167	130.5645	130.5645	134.9167	130.5645	134.9167	130.5645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	257.6786	260.3525	253.6144	239.2697	221.1621	204.1435	192.7740	190.1001	196.8383	211.1830	229.2906	246.3092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	(71)
Water heating gains (Table 5)													
	51.9836	50.6743	48.6531	44.8874	42.4039	39.8546	38.6032	40.1311	41.8492	44.6507	48.2907	51.5619	(72)
Total internal gains													
	504.4343	519.7879	497.0396	483.2813	458.3380	443.1223	426.1492	425.0033	437.8116	450.6057	476.7055	492.6431	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1800	11.2829	0.6300	0.7000	0.7700	7.5171	(75)
East	4.9100	19.6403	0.6300	0.7000	0.7700	29.4714	(76)
Southeast	6.8000	36.7938	0.6300	0.7000	0.7700	76.4638	(77)
South	2.4600	46.7521	0.6300	0.7000	0.7700	35.1486	(78)
West	4.3400	19.6403	0.6300	0.7000	0.7700	26.0501	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	174.6509	311.7235	457.9713	609.8271	714.2474	720.8016	690.2001	611.8293	511.1835	353.6146	211.9362	147.6057	(83)
Total gains	679.0852	831.5114	955.0108	1093.1083	1172.5854	1163.9239	1116.3493	1036.8326	948.9951	804.2203	688.6417	640.2488	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.4085	66.6154	66.8196	67.7953	67.9811	68.8593	68.8593	69.0244	68.5183	67.9811	67.6064	67.2190	
alpha	5.4272	5.4410	5.4546	5.5197	5.5321	5.5906	5.5906	5.6016	5.5679	5.5321	5.5071	5.4813	
util living area													
	0.9960	0.9877	0.9651	0.8874	0.7351	0.5349	0.3882	0.4349	0.6848	0.9330	0.9896	0.9970	(86)
MIT	19.8462	20.0816	20.3806	20.7266	20.9231	20.9891	20.9985	20.9972	20.9605	20.6746	20.1973	19.8127	(87)
Th 2	20.0701	20.0728	20.0753	20.0874	20.0897	20.1003	20.1003	20.1022	20.0962	20.0897	20.0851	20.0803	(88)
util rest of house													
	0.9947	0.9840	0.9547	0.8577	0.6799	0.4633	0.3095	0.3513	0.6090	0.9078	0.9859	0.9961	(89)
MIT 2	19.0216	19.2566	19.5500	19.8802	20.0423	20.0956	20.0999	20.1015	20.0767	19.8437	19.3825	18.9965	(90)
Living area fraction									fLA = Living area / (4) =			0.3609	(91)
MIT	19.3192	19.5543	19.8498	20.1856	20.3601	20.4181	20.4242	20.4247	20.3957	20.1435	19.6765	19.2910	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3192	19.5543	19.8498	20.1856	20.3601	20.4181	20.4242	20.4247	20.3957	20.1435	19.6765	19.2910	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9934	0.9814	0.9517	0.8612	0.6970	0.4890	0.3379	0.3815	0.6352	0.9095	0.9837	0.9950	(94)
Useful gains	674.5810	816.0603	908.8481	941.3593	817.3263	569.1009	377.2175	395.5372	602.7638	731.4696	677.4267	637.0692	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1538.5588	1496.5195	1359.1325	1132.4429	866.6182	574.7883	377.8031	396.6652	625.0667	955.0212	1265.5077	1527.2775	(97)
Space heating kWh													
	642.7995	457.2686	335.0115	137.5802	36.6732	0.0000	0.0000	0.0000	0.0000	166.3224	423.4183	662.3150	(98a)
Space heating requirement - total per year (kWh/year)												2861.3886	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	642.7995	457.2686	335.0115	137.5802	36.6732	0.0000	0.0000	0.0000	0.0000	166.3224	423.4183	662.3150	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2861.3886	
Space heating per m2											(98c) / (4) =	28.3755	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	928.6608	731.0734	749.0360	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9522	0.9790	0.9681	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	884.2863	715.7368	725.1508	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1307.6392	1254.5704	1164.2064	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	304.8141	400.8922	326.6573	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	76.2035	100.2231	81.6643	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												258.0909	(107)
Energy for space heating												28.3755	(99)
Energy for space cooling												2.5594	(108)

Total	30.9349 (109)
Fabric Energy Efficiency (TFEE)	30.9 (109)

Full SAP Calculation Printout

Plot Reference	P-24	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-24
Plot Address	Flat 4, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	85 B	**DER**	3.75	**TER**	10.51
Environmental	97 A	**% DER < TER**			64.32
CO_2 Emissions (t/year)	0.3	**DFEE**	30.42	**TFEE**	30.93
Compliance Check	See BREL	**% DFEE < TFEE**			1.67
% DPER < TPER	29.87	**DPER**	38.75	**TPER**	55.25

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.8400	(1b)	x 2.5500	(2b) =	257.1420	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	257.1420	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5300	(17)
Infiltration rate		0.1265	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1075	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1371	0.1344	0.1317	0.1183	0.1156	0.1021	0.1021	0.0995	0.1075	0.1156	0.1210	0.1263	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2771	0.2744	0.2717	0.2583	0.2556	0.2421	0.2421	0.2395	0.2475	0.2556	0.2610	0.2663	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			16.3500	1.2357	20.2044			(27)
Brickwork	84.3500	20.6900	63.6600	0.2100	13.3686	110.0000	7002.5998	(29a)
Communal Wall	6.5200	2.0600	4.4600	0.2200	0.9812	110.0000	490.6000	(29a)
Stairwell Wall	7.6100		7.6100	0.2500	1.9025	110.0000	837.1000	(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.8981			(33)
Main dwelling								
Party Wall 1			38.3000	0.0000	0.0000	110.0000	4212.9999	(32)
Party Floor 1			100.8400			70.0000	7058.8000	(32d)
Party Ceiling 1			100.8400			30.0000	3025.2000	(32b)
Internal Wall 1			207.0000			9.0000	1863.0000	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			24490.2998	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.8630 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.8100	0.0380	2.8048
E16 Corner (normal)	14.4000	0.0540	0.7776
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	37.6900	0.0160	0.6030
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	1.5700	0.3300	0.5181
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4587 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 51.3568 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.5134	23.2853	23.0571	21.9166	21.6885	20.5480	20.5480	20.3199	21.0042	21.6885	22.1447	22.6009	(38)
Heat transfer coeff	74.8701	74.6420	74.4139	73.2734	73.0453	71.9048	71.9048	71.6767	72.3610	73.0453	73.5015	73.9577	(39)
Average = Sum(39)m / 12 =												73.2164	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7425	0.7402	0.7379	0.7266	0.7244	0.7131	0.7131	0.7108	0.7176	0.7244	0.7289	0.7334	(40)
HLP (average)												0.7261	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7472 (42)

Hot water usage for mixer showers

70.2807	69.2246	67.6855	64.7408	62.5676	60.1442	58.7667	60.2941	61.9684	64.5705	67.5785	70.0115	(42a)

Hot water usage for baths

30.3462	29.8956	29.2609	28.0907	27.2145	26.2429	25.7181	26.3483	27.0345	28.0741	29.2684	30.2437	(42b)

Hot water usage for other uses

42.7637	41.2087	39.6536	38.0986	36.5436	34.9885	34.9885	36.5436	38.0986	39.6536	41.2087	42.7637	(42c)

Average daily hot water use (litres/day) 131.8084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.3907	140.3288	136.6000	130.9301	126.3257	121.3756	119.4733	123.1860	127.1015	132.2983	138.0556	143.0189	(44)
Energy conte	227.0959	199.8264	209.9492	179.2367	170.0586	149.2454	144.4926	152.5299	156.7289	179.5275	196.6855	223.9330	(45)
Energy content (annual)										Total = Sum(45)m =		2189.3096	
Distribution loss (46)m = 0.15 x (45)m	34.0644	29.9740	31.4924	26.8855	25.5088	22.3868	21.6739	22.8795	23.5093	26.9291	29.5028	33.5899	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(64)
										Total per year (kWh/year) = Sum(64)m =		2534.2346	(64)
12Total per year (kWh/year)												2534	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	75.5094	66.4423	69.8081	59.5962	56.5445	49.6241	48.0438	50.7162	52.1124	59.6929	65.3979	74.4577	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.5645	144.5536	130.5645	134.9167	130.5645	134.9167	130.5645	130.5645	134.9167	130.5645	134.9167	130.5645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.6786	260.3525	253.6144	239.2697	221.1621	204.1435	192.7740	190.1001	196.8383	211.1830	229.2906	246.3092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	(71)
Water heating gains (Table 5)	101.4911	98.8724	93.8281	82.7725	76.0007	68.9224	64.5750	68.1669	72.3783	80.2324	90.8305	100.0776	(72)
Total internal gains	553.9418	567.9860	542.2145	521.1664	491.9348	472.1901	452.1210	453.0391	468.3407	486.1874	519.2452	541.1588	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	19.6403	0.3300	0.0000	0.7700	21.6592	(80)
Northeast	2.1800	11.2829	0.3100	0.0000	0.7700	5.8713	(75)
East	4.9100	19.6403	0.3100	0.0000	0.7700	23.0187	(76)

Southeast			6.8000		36.7938		0.3100		0.0000		0.7700		59.7223 (77)
South			2.4600		46.7521		0.3100		0.0000		0.7700		27.4529 (78)
Solar gains	137.7243	246.0405	361.9288	482.4750	565.4239	570.7220	546.4495	484.1990	404.1799	279.2388	167.1702	116.3673 (83)	
Total gains	691.6661	814.0265	904.1433	1003.6414	1057.3586	1042.9121	998.5705	937.2381	872.5206	765.4262	686.4154	657.5261 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	90.8621	91.1398	91.4192	92.8422	93.1321	94.6093	94.6093	94.9104	94.0128	93.1321	92.5540	91.9831	
alpha	7.0575	7.0760	7.0946	7.1895	7.2088	7.3073	7.3073	7.3274	7.2675	7.2088	7.1703	7.1322	
util living area	0.9931	0.9786	0.9393	0.8172	0.6328	0.4406	0.3168	0.3517	0.5680	0.8748	0.9803	0.9949 (86)	
MIT	20.3368	20.5229	20.7293	20.9215	20.9879	20.9992	20.9999	20.9999	20.9956	20.8936	20.5884	20.3063 (87)	
Th 2	20.3035	20.3055	20.3074	20.3174	20.3194	20.3293	20.3293	20.3313	20.3253	20.3194	20.3154	20.3114 (88)	
util rest of house	0.9911	0.9730	0.9249	0.7852	0.5896	0.3947	0.2685	0.3006	0.5142	0.8427	0.9742	0.9935 (89)	
MIT 2	19.5292	19.7648	20.0183	20.2438	20.3100	20.3289	20.3293	20.3313	20.3226	20.2209	19.8570	19.4969 (90)	
Living area fraction									fLA = Living area / (4) =			0.3609 (91)	
MIT	19.8207	20.0384	20.2749	20.4884	20.5546	20.5708	20.5713	20.5725	20.5655	20.4637	20.1209	19.7890 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.8207	20.0384	20.2749	20.4884	20.5546	20.5708	20.5713	20.5725	20.5655	20.4637	20.1209	19.7890 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9894	0.9704	0.9241	0.7935	0.6047	0.4113	0.2859	0.3191	0.5335	0.8500	0.9721	0.9921 (94)	
Useful gains	684.3615	789.9689	835.5214	796.4214	639.3954	428.9429	285.5344	299.0269	465.4931	650.6296	667.2404	652.3245 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	1162.0359	1129.9580	1025.0436	849.1197	646.7896	429.3284	285.5561	299.0741	467.8473	720.4967	957.0579	1152.9279 (97)	
Space heating kWh	355.3898	228.4727	141.0045	37.9428	5.5013	0.0000	0.0000	0.0000	0.0000	51.9811	208.6686	372.4489 (98a)	
Space heating requirement - total per year (kWh/year)												1401.4098	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	355.3898	228.4727	141.0045	37.9428	5.5013	0.0000	0.0000	0.0000	0.0000	51.9811	208.6686	372.4489 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1401.4098	
Space heating per m2											(98c) / (4) =	13.8974 (99)	

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	355.3898	228.4727	141.0045	37.9428	5.5013	0.0000	0.0000	0.0000	0.0000	51.9811	208.6686	372.4489 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	355.3898	228.4727	141.0045	37.9428	5.5013	0.0000	0.0000	0.0000	0.0000	51.9811	208.6686	372.4489 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280 (64)	
Efficiency of water heater												361.6650 (216)	
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)	
Fuel for water heating, kWh/month	70.8918	62.5679	66.1508	57.3975	55.1211	49.1050	48.0521	50.2744	51.1741	57.7392	62.2221	70.0173 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	16.3195	14.7402	16.3195	15.7931	16.3195	15.7931	16.3195	16.3195	15.7931	16.3195	15.7931	16.3195 (231)	
Lighting	26.5742	21.3188	19.1952	14.0633	10.8629	8.8751	9.9095	12.8807	16.7308	21.9517	24.7944	27.3128 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												1401.4098 (211)	
Space heating fuel - main system 2												0.0000 (213)	

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	700.7133	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	192.1493	(230a)
Total electricity for the above, kWh/year	192.1493	(231)
Electricity for lighting (calculated in Appendix L)	214.4693	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2508.7416	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1401.4098	0.1581	221.4974	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	700.7133	0.1412	98.9324	(264)
Space and water heating			320.4298	(265)
Pumps, fans and electric keep-hot	192.1493	0.1387	26.6535	(267)
Energy for lighting	214.4693	0.1443	30.9545	(268)
Total CO2, kg/year			378.0378	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1401.4098	1.5851	2221.3128	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	700.7133	1.5221	1066.5393	(278)
Space and water heating			3287.8521	(279)
Pumps, fans and electric keep-hot	192.1493	1.5128	290.6835	(281)
Energy for lighting	214.4693	1.5338	328.9601	(282)
Total Primary energy kWh/year			3907.4958	(286)
Dwelling Primary energy Rate (DPER)			38.7500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.8400	(1b) x	2.5500	(2b) =	257.1420	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		257.1420	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1556	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4056	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3447	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4395	0.4309	0.4223	0.3792	0.3706	0.3275	0.3275	0.3189	0.3447	0.3706	0.3878	0.4050	(22b)
Effective ac	0.5966	0.5928	0.5892	0.5719	0.5687	0.5536	0.5536	0.5508	0.5594	0.5687	0.5752	0.5820	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.6900	1.1450	23.6908			(27)
Brickwork	84.3500	20.6900	63.6600	0.1800	11.4588			(29a)
Communal Wall	6.5200	2.0600	4.4600	0.1800	0.8028			(29a)
Stairwell Wall	7.6100		7.6100	0.1800	1.3698			(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.3822			(33)
Main dwelling								
Party Wall 1			38.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.8630 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.8100	0.0700	5.1667
E16 Corner (normal)	14.4000	0.0900	1.2960
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	37.6900	0.0500	1.8845
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	1.5700	0.0200	0.0314
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.4327 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 51.8149 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	50.6247	50.3064	49.9945	48.5292	48.2550	46.9788	46.9788	46.7424	47.4704	48.2550	48.8096	49.3894	(38)
Heat transfer coeff	102.4397	102.1214	101.8094	100.3441	100.0699	98.7937	98.7937	98.5574	99.2853	100.0699	100.6246	101.2044	(39)

Average = Sum(39)m / 12 = 100.3428

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0159	1.0127	1.0096	0.9951	0.9924	0.9797	0.9797	0.9774	0.9846	0.9924	0.9979	1.0036	(40)
HLP (average)												0.9951	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7472 (42)

Hot water usage for mixer showers

70.2807	69.2246	67.6855	64.7408	62.5676	60.1442	58.7667	60.2941	61.9684	64.5705	67.5785	70.0115	(42a)

Hot water usage for baths

30.3462	29.8956	29.2609	28.0907	27.2145	26.2429	25.7181	26.3483	27.0345	28.0741	29.2684	30.2437	(42b)

Hot water usage for other uses

42.7637	41.2087	39.6536	38.0986	36.5436	34.9885	34.9885	36.5436	38.0986	39.6536	41.2087	42.7637	(42c)

Average daily hot water use (litres/day) 131.8084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.3907	140.3288	136.6000	130.9301	126.3257	121.3756	119.4733	123.1860	127.1015	132.2983	138.0556	143.0189	(44)
Energy conte	227.0959	199.8264	209.9492	179.2367	170.0586	149.2454	144.4926	152.5299	156.7289	179.5275	196.6855	223.9330	(45)
Energy content (annual)										Total = Sum(45)m =		2189.3096	
Distribution loss (46)m = 0.15 x (45)m	34.0644	29.9740	31.4924	26.8855	25.5088	22.3868	21.6739	22.8795	23.5093	26.9291	29.5028	33.5899	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.6908	241.9121	256.5441	224.3286	216.6535	194.3373	191.0875	199.1248	201.8207	226.1224	241.7773	270.5279	(62)
WWHRS	-32.1294	-28.4155	-29.7551	-24.6384	-22.9621	-19.6488	-18.4177	-19.5853	-20.3294	-23.9662	-27.1508	-31.5344	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.5613	213.4966	226.7890	199.6902	193.6914	174.6884	172.6698	179.5395	181.4913	202.1562	214.6266	238.9934	(64)
										Total per year (kWh/year) = Sum(64)m =		2439.3938	(64)
12Total per year (kWh/year)												2439	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	112.7853	100.1108	107.0840	95.6697	93.8204	85.6976	85.3197	87.9921	88.1858	96.9688	101.4714	111.7336	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	137.3583	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.5645	144.5536	130.5645	134.9167	130.5645	134.9167	130.5645	130.5645	134.9167	130.5645	134.9167	130.5645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.6786	260.3525	253.6144	239.2697	221.1621	204.1435	192.7740	190.1001	196.8383	211.1830	229.2906	246.3092	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	36.7358	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	(71)
Water heating gains (Table 5)	151.5931	148.9745	143.9301	132.8746	126.1027	119.0244	114.6770	118.2690	122.4803	130.3344	140.9325	150.1796	(72)
Total internal gains	607.0438	621.0881	595.3166	574.2684	545.0368	522.2921	502.2231	503.1412	518.4428	539.2894	572.3473	594.2608	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1800	11.2829	0.6300	0.7000	0.7700	7.5171	(75)
East	4.9100	19.6403	0.6300	0.7000	0.7700	29.4714	(76)
Southeast	6.8000	36.7938	0.6300	0.7000	0.7700	76.4638	(77)
South	2.4600	46.7521	0.6300	0.7000	0.7700	35.1486	(78)
West	4.3400	19.6403	0.6300	0.7000	0.7700	26.0501	(80)

Solar gains	174.6509	311.7235	457.9713	609.8271	714.2474	720.8016	690.2001	611.8293	511.1835	353.6146	211.9362	147.6057	(83)
Total gains	781.6947	932.8115	1053.2878	1184.0955	1259.2842	1243.0937	1192.4231	1114.9705	1029.6263	892.9040	784.2835	741.8665	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.4085	66.6154	66.8196	67.7953	67.9811	68.8593	68.8593	69.0244	68.5183	67.9811	67.6064	67.2190	
alpha	5.4272	5.4410	5.4546	5.5197	5.5321	5.5906	5.5906	5.6016	5.5679	5.5321	5.5071	5.4813	
util living area	0.9922	0.9797	0.9488	0.8570	0.6970	0.5029	0.3637	0.4051	0.6406	0.9038	0.9814	0.9940	(86)
MIT	19.9569	20.1849	20.4674	20.7767	20.9407	20.9919	20.9989	20.9980	20.9714	20.7381	20.2960	19.9235	(87)
Th 2	20.0701	20.0728	20.0753	20.0874	20.0897	20.1003	20.1003	20.1022	20.0962	20.0897	20.0851	20.0803	(88)
util rest of house	0.9899	0.9738	0.9346	0.8232	0.6413	0.4347	0.2898	0.3268	0.5663	0.8717	0.9751	0.9922	(89)
MIT 2	18.8653	19.1546	19.5055	19.8749	20.0437	20.0959	20.0999	20.1016	20.0786	19.8435	19.3068	18.8305	(90)
Living area fraction									fLA = Living area / (4) =			0.3609	(91)
MIT	19.2592	19.5264	19.8526	20.2004	20.3674	20.4193	20.4243	20.4251	20.4008	20.1663	19.6638	19.2250	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2592	19.5264	19.8526	20.2004	20.3674	20.4193	20.4243	20.4251	20.4008	20.1663	19.6638	19.2250	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9696	0.9306	0.8277	0.6589	0.4591	0.3165	0.3551	0.5921	0.8748	0.9713	0.9899	(94)
Useful gains	771.6412	904.4081	980.2352	980.0880	829.7416	570.7360	377.4023	395.9171	609.6561	781.1018	761.8023	734.3602	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1532.4199	1493.6695	1359.4186	1133.9235	867.3485	574.9082	377.8206	396.7005	625.5756	957.2995	1264.2219	1520.5908	(97)
Space heating kWh	566.0194	395.9837	282.1125	110.7616	27.9795	0.0000	0.0000	0.0000	0.0000	131.0911	361.7421	584.9556	(98a)
Space heating requirement - total per year (kWh/year)												2460.6454	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	566.0194	395.9837	282.1125	110.7616	27.9795	0.0000	0.0000	0.0000	0.0000	131.0911	361.7421	584.9556	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2460.6454	
Space heating per m2											(98c) / (4) =	24.4015	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	566.0194	395.9837	282.1125	110.7616	27.9795	0.0000	0.0000	0.0000	0.0000	131.0911	361.7421	584.9556	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	613.2387	429.0181	305.6473	120.0017	30.3137	0.0000	0.0000	0.0000	0.0000	142.0272	391.9200	633.7547	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	241.5613	213.4966	226.7890	199.6902	193.6914	174.6884	172.6698	179.5395	181.4913	202.1562	214.6266	238.9934	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9021	85.4251	84.5504	82.7938	80.8341	79.8000	79.8000	79.8000	79.8000	83.1137	85.2209	85.9871	(217)
Fuel for water heating, kWh/month	281.2054	249.9224	268.2292	241.1898	239.6161	218.9078	216.3782	224.9869	227.4327	243.2286	251.8472	277.9411	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.1287	21.7637	19.5958	14.3567	11.0895	9.0602	10.1162	13.1495	17.0799	22.4097	25.3117	27.8827	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.5142	-39.0135	-58.4928	-68.6772	-76.5728	-72.3621	-71.4477	-66.1877	-57.3690	-45.8615	-29.7138	-22.7343	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-10.3983	-22.2731	-45.0293	-68.7685	-92.0656	-92.9483	-91.8851	-77.3021	-55.9899	-32.2561	-14.0094	-8.1954 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2665.9214	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2940.8855	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	218.9444	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1246.0674	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4665.6839	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2665.9214	0.2100	559.8435	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2940.8855	0.2100	617.5860	(264)
Space and water heating			1177.4294	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	218.9444	0.1443	31.6004	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-634.9465	0.1337	-84.8976	
PV Unit electricity exported	-611.1209	0.1254	-76.6355	
Total			-161.5331	(269)
Total CO2, kg/year			1059.4261	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2665.9214	1.1300	3012.4911	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2940.8855	1.1300	3323.2006	(278)
Space and water heating			6335.6918	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	218.9444	1.5338	335.8242	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-634.9465	1.4941	-948.6822	
PV Unit electricity exported	-611.1209	0.4603	-281.2899	
Total			-1229.9722	(283)
Total Primary energy kWh/year			5571.6446	(286)
Target Primary Energy Rate (TPER)			55.2500	(287)

Full SAP Calculation Printout

Plot Reference	P-24	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-24
Plot Address	Flat 4, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	85 B	**DER**	3.75	**TER**	10.51
Environmental	97 A	**% DER < TER**			64.32
CO_2 Emissions (t/year)	0.3	**DFEE**	30.42	**TFEE**	30.93
Compliance Check	See BREL	**% DFEE < TFEE**			1.67
% DPER < TPER	29.87	**DPER**	38.75	**TPER**	55.25

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.8400	(1b)	x 2.5500	(2b) =	257.1420	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8400					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	257.1420	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5300	(17)
Infiltration rate		0.1265	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1075	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1371	0.1344	0.1317	0.1183	0.1156	0.1021	0.1021	0.0995	0.1075	0.1156	0.1210	0.1263	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2771	0.2744	0.2717	0.2583	0.2556	0.2421	0.2421	0.2395	0.2475	0.2556	0.2610	0.2663	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			16.3500	1.2357	20.2044			(27)
Brickwork	84.3500	20.6900	63.6600	0.2100	13.3686	110.0000	7002.5998	(29a)
Communal Wall	6.5200	2.0600	4.4600	0.2200	0.9812	110.0000	490.6000	(29a)
Stairwell Wall	7.6100		7.6100	0.2500	1.9025	110.0000	837.1000	(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.8981			(33)
Main dwelling								
Party Wall 1			38.3000	0.0000	0.0000	110.0000	4212.9999	(32)
Party Floor 1			100.8400			70.0000	7058.8000	(32d)
Party Ceiling 1			100.8400			30.0000	3025.2000	(32b)
Internal Wall 1			207.0000			9.0000	1863.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		24490.2998	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.8630 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	73.8100	0.0380	2.8048
E16	Corner (normal)	14.4000	0.0540	0.7776
E17	Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	26.6000	0.0000	0.0000
E2	Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4	Jamb	37.6900	0.0160	0.6030
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	1.5700	0.3300	0.5181
E5	Ground floor (normal)	24.5000	0.1120	2.7440
E25	Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4587 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 51.3568 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.5134	23.2853	23.0571	21.9166	21.6885	20.5480	20.5480	20.3199	21.0042	21.6885	22.1447	22.6009	(38)
Heat transfer coeff	74.8701	74.6420	74.4139	73.2734	73.0453	71.9048	71.9048	71.6767	72.3610	73.0453	73.5015	73.9577	(39)
Average = Sum(39)m / 12 =												73.2164	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7425	0.7402	0.7379	0.7266	0.7244	0.7131	0.7131	0.7108	0.7176	0.7244	0.7289	0.7334	(40)
HLP (average)												0.7261	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7472 (42)

Hot water usage for mixer showers

70.2807	69.2246	67.6855	64.7408	62.5676	60.1442	58.7667	60.2941	61.9684	64.5705	67.5785	70.0115	(42a)

Hot water usage for baths

30.3462	29.8956	29.2609	28.0907	27.2145	26.2429	25.7181	26.3483	27.0345	28.0741	29.2684	30.2437	(42b)

Hot water usage for other uses

42.7637	41.2087	39.6536	38.0986	36.5436	34.9885	34.9885	36.5436	38.0986	39.6536	41.2087	42.7637	(42c)

Average daily hot water use (litres/day) 131.8084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.3907	140.3288	136.6000	130.9301	126.3257	121.3756	119.4733	123.1860	127.1015	132.2983	138.0556	143.0189	(44)
Energy conte	227.0959	199.8264	209.9492	179.2367	170.0586	149.2454	144.4926	152.5299	156.7289	179.5275	196.6855	223.9330	(45)
Energy content (annual)										Total = Sum(45)m =		2189.3096	
Distribution loss (46)m = 0.15 x (45)m	34.0644	29.9740	31.4924	26.8855	25.5088	22.3868	21.6739	22.8795	23.5093	26.9291	29.5028	33.5899	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(64)
										Total per year (kWh/year) = Sum(64)m =		2534.2346	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	75.5094	66.4423	69.8081	59.5962	56.5445	49.6241	48.0438	50.7162	52.1124	59.6929	65.3979	74.4577	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.3603	26.9658	21.9301	16.6025	12.4105	10.4775	11.3213	14.7159	19.7516	25.0792	29.2711	31.2042	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	384.5950	388.5859	378.5289	357.1189	330.0927	304.6918	287.7224	283.7316	293.7885	315.1985	342.2247	367.6256	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	(71)
Water heating gains (Table 5)	101.4911	98.8724	93.8281	82.7725	76.0007	68.9224	64.5750	68.1669	72.3783	80.2324	90.8305	100.0776	(72)
Total internal gains	625.6199	623.5976	603.4606	565.6674	527.6774	493.2652	472.7922	475.7879	495.0919	529.6835	571.4998	608.0809	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	19.6403	0.3300	0.0000	0.7700	21.6592	(80)
Northeast	2.1800	11.2829	0.3100	0.0000	0.7700	5.8713	(75)
East	4.9100	19.6403	0.3100	0.0000	0.7700	23.0187	(76)
Southeast	6.8000	36.7938	0.3100	0.0000	0.7700	59.7223	(77)

South			2.4600	46.7521	0.3100	0.0000	0.7700					27.4529	(78)
Solar gains	137.7243	246.0405	361.9288	482.4750	565.4239	570.7220	546.4495	484.1990	404.1799	279.2388	167.1702	116.3673	(83)
Total gains	763.3442	869.6380	965.3894	1048.1424	1093.1012	1063.9872	1019.2417	959.9868	899.2718	808.9223	738.6700	724.4482	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	90.8621	91.1398	91.4192	92.8422	93.1321	94.6093	94.6093	94.9104	94.0128	93.1321	92.5540	91.9831	
alpha	7.0575	7.0760	7.0946	7.1895	7.2088	7.3073	7.3073	7.3274	7.2675	7.2088	7.1703	7.1322	
util living area													
	0.9878	0.9698	0.9195	0.7934	0.6137	0.4320	0.3104	0.3434	0.5518	0.8489	0.9709	0.9910	(86)
MIT	20.4159	20.5780	20.7746	20.9351	20.9900	20.9993	20.9999	20.9999	20.9963	20.9138	20.6406	20.3815	(87)
Th 2	20.3035	20.3055	20.3074	20.3174	20.3194	20.3293	20.3293	20.3313	20.3253	20.3194	20.3154	20.3114	(88)
util rest of house													
	0.9845	0.9623	0.9020	0.7603	0.5714	0.3870	0.2631	0.2935	0.4993	0.8139	0.9624	0.9885	(89)
MIT 2	19.6289	19.8324	20.0706	20.2573	20.3117	20.3289	20.3293	20.3313	20.3231	20.2412	19.9209	19.5921	(90)
Living area fraction										fLA = Living area / (4) =		0.3609	(91)
MIT	19.9129	20.1015	20.3246	20.5019	20.5565	20.5709	20.5713	20.5726	20.5660	20.4839	20.1806	19.8769	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9129	20.1015	20.3246	20.5019	20.5565	20.5709	20.5713	20.5726	20.5660	20.4839	20.1806	19.8769	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9823	0.9597	0.9025	0.7696	0.5862	0.4032	0.2801	0.3115	0.5181	0.8229	0.9604	0.9866	(94)
Useful gains	749.8196	834.6314	871.2272	806.6475	640.8217	428.9956	285.5376	299.0349	465.9342	665.6332	709.4174	714.7396	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1168.9402	1134.6700	1028.7442	850.1100	646.9223	429.3333	285.5564	299.0749	467.8882	721.9726	961.4453	1159.4311	(97)
Space heating kWh													
	311.8258	201.6259	117.1927	31.2930	4.5389	0.0000	0.0000	0.0000	0.0000	41.9165	181.4601	330.8505	(98a)
Space heating requirement - total per year (kWh/year)												1220.7033	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	311.8258	201.6259	117.1927	31.2930	4.5389	0.0000	0.0000	0.0000	0.0000	41.9165	181.4601	330.8505	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1220.7033	
Space heating per m2											(98c) / (4) =	12.1053	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	311.8258	201.6259	117.1927	31.2930	4.5389	0.0000	0.0000	0.0000	0.0000	41.9165	181.4601	330.8505	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	311.8258	201.6259	117.1927	31.2930	4.5389	0.0000	0.0000	0.0000	0.0000	41.9165	181.4601	330.8505	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	70.8918	62.5679	66.1508	57.3975	55.1211	49.1050	48.0521	50.2744	51.1741	57.7392	62.2221	70.0173	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.3195	14.7402	16.3195	15.7931	16.3195	15.7931	16.3195	16.3195	15.7931	16.3195	15.7931	16.3195	(231)
Lighting	26.5742	21.3188	19.1952	14.0633	10.8629	8.8751	9.9095	12.8807	16.7308	21.9517	24.7944	27.3128	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1220.7033	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	361.6650	
Water heating fuel used	700.7133	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	192.1493	(230a)
Total electricity for the above, kWh/year	192.1493	(231)
Electricity for lighting (calculated in Appendix L)	214.4693	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2328.0352	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1220.7033	16.4900	201.2940	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	700.7133	16.4900	115.5476	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	192.1493	16.4900	31.6854	(249)
Energy for lighting	214.4693	16.4900	35.3660	(250)
Additional standing charges			0.0000	(251)
Total energy cost			383.8930	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9476	(257)
SAP value		84.6390	
SAP rating (Section 12)		85	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1220.7033	0.1582	193.1220	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	700.7133	0.1412	98.9324	(264)
Space and water heating			292.0544	(265)
Pumps, fans and electric keep-hot	192.1493	0.1387	26.6535	(267)
Energy for lighting	214.4693	0.1443	30.9545	(268)
Total CO2, kg/year			349.6624	(272)
CO2 emissions per m2			3.4700	(273)
EI value			96.7872	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.8400	(1b) x	2.5500	(2b) =	257.1420	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 100.8400						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		257.1420	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.5300	(17)
Infiltration rate	0.1265	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1075	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1156	0.1102	0.1102	0.1021	0.1048	0.0914	0.0914	0.0887	0.0914	0.1021	0.0995	0.1075	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2556	0.2502	0.2502	0.2421	0.2448	0.2314	0.2314	0.2287	0.2314	0.2421	0.2395	0.2475	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			16.3500	1.2357	20.2044			(27)
Brickwork	84.3500	20.6900	63.6600	0.2100	13.3686	110.0000	7002.5998	(29a)
Communal Wall	6.5200	2.0600	4.4600	0.2200	0.9812	110.0000	490.6000	(29a)
Stairwell Wall	7.6100		7.6100	0.2500	1.9025	110.0000	837.1000	(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.8981			(33)
Main dwelling								
Party Wall 1			38.3000	0.0000	0.0000	110.0000	4212.9999	(32)
Party Floor 1			100.8400			70.0000	7058.8000	(32d)
Party Ceiling 1			100.8400			30.0000	3025.2000	(32b)
Internal Wall 1			207.0000			9.0000	1863.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	24490.2998	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.8630	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.8100	0.0380	2.8048
E16 Corner (normal)	14.4000	0.0540	0.7776
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	37.6900	0.0160	0.6030
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	1.5700	0.3300	0.5181
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.4587	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	51.3568	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.6885	21.2323	21.2323	20.5480	20.7761	19.6356	19.6356	19.4075	19.6356	20.5480	20.3199	21.0042	(38)
Heat transfer coeff	73.0453	72.5891	72.5891	71.9048	72.1329	70.9923	70.9923	70.7642	70.9923	71.9048	71.6767	72.3610	(39)
Average = Sum(39)m / 12 =												71.8287	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7244	0.7198	0.7198	0.7131	0.7153	0.7040	0.7040	0.7017	0.7040	0.7131	0.7108	0.7176	(40)
HLP (average)												0.7123	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7472	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
70.2807	69.2246	67.6855	64.7408	62.5676	60.1442	58.7667	60.2941	61.9684	64.5705	67.5785	70.0115	(42a)

Hot water usage for baths

30.3462	29.8956	29.2609	28.0907	27.2145	26.2429	25.7181	26.3483	27.0345	28.0741	29.2684	30.2437	(42b)

Hot water usage for other uses

42.7637	41.2087	39.6536	38.0986	36.5436	34.9885	34.9885	36.5436	38.0986	39.6536	41.2087	42.7637	(42c)

Average daily hot water use (litres/day)	131.8084	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.3907	140.3288	136.6000	130.9301	126.3257	121.3756	119.4733	123.1860	127.1015	132.2983	138.0556	143.0189	(44)
Energy conte	227.0959	199.8264	209.9492	179.2367	170.0586	149.2454	144.4926	152.5299	156.7289	179.5275	196.6855	223.9330	(45)
Energy content (annual)										Total = Sum(45)m =		2189.3096	
Distribution loss (46)m = 0.15 x (45)m	34.0644	29.9740	31.4924	26.8855	25.5088	22.3868	21.6739	22.8795	23.5093	26.9291	29.5028	33.5899	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280 (64)
Total per year (kWh/year) = Sum(64)m =												2534.2346 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	75.5094	66.4423	69.8081	59.5962	56.5445	49.6241	48.0438	50.7162	52.1124	59.6929	65.3979	74.4577 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.3603	26.9658	21.9301	16.6025	12.4105	10.4775	11.3213	14.7159	19.7516	25.0792	29.2711	31.2042	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	384.5950	388.5859	378.5289	357.1189	330.0927	304.6918	287.7224	283.7316	293.7885	315.1985	342.2247	367.6256	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	(71)
Water heating gains (Table 5)													
	101.4911	98.8724	93.8281	82.7725	76.0007	68.9224	64.5750	68.1669	72.3783	80.2324	90.8305	100.0776	(72)
Total internal gains													
	625.6199	623.5976	603.4606	565.6674	527.6774	493.2652	472.7922	475.7879	495.0919	529.6835	571.4998	608.0809	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	23.8018	0.3300	0.0000	0.7700	26.2484	(80)
Northeast	2.1800	13.7804	0.3100	0.0000	0.7700	7.1709	(75)
East	4.9100	23.8018	0.3100	0.0000	0.7700	27.8961	(76)
Southeast	6.8000	43.0593	0.3100	0.0000	0.7700	69.8921	(77)
South	2.4600	54.2217	0.3100	0.0000	0.7700	31.8391	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	163.0466	254.7719	372.8971	506.4376	579.9448	620.0086	587.4584	532.4304	444.4966	310.5629	195.0037	138.5335	(83)
Total gains	788.6665	878.3695	976.3577	1072.1050	1107.6222	1113.2737	1060.2506	1008.2183	939.5885	840.2464	766.5035	746.6144	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	93.1321	93.7174	93.7174	94.6093	94.3101	95.8253	95.8253	96.1342	95.8253	94.6093	94.9104	94.0128	
alpha	7.2088	7.2478	7.2478	7.3073	7.2873	7.3884	7.3884	7.4089	7.3884	7.3073	7.3274	7.2675	
util living area													
	0.9794	0.9554	0.8836	0.7204	0.5251	0.3315	0.2210	0.2386	0.4526	0.7722	0.9472	0.9844	(86)
MIT	20.5405	20.6790	20.8527	20.9694	20.9969	20.9999	21.0000	21.0000	20.9992	20.9594	20.7563	20.5084	(87)
Th 2	20.3194	20.3233	20.3233	20.3293	20.3273	20.3373	20.3373	20.3393	20.3373	20.3293	20.3313	20.3253	(88)
util rest of house													
	0.9740	0.9447	0.8605	0.6832	0.4824	0.2893	0.1766	0.1923	0.4030	0.7292	0.9327	0.9801	(89)
MIT 2	19.7986	19.9718	20.1747	20.3028	20.3252	20.3373	20.3373	20.3393	20.3369	20.2956	20.0745	19.7638	(90)
Living area fraction									fLA = Living area / (4) =			0.3609	(91)
MIT	20.0663	20.2270	20.4194	20.5434	20.5676	20.5764	20.5764	20.5777	20.5759	20.5352	20.3205	20.0325	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0663	20.2270	20.4194	20.5434	20.5676	20.5764	20.5764	20.5777	20.5759	20.5352	20.3205	20.0325	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9716	0.9429	0.8640	0.6953	0.4978	0.3046	0.1926	0.2090	0.4209	0.7428	0.9324	0.9779	(94)
Useful gains	766.2603	828.2566	843.5418	745.4530	551.3243	339.0509	204.2045	210.7143	395.4592	624.1692	714.7183	730.1214	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1093.2203	1054.5015	945.0659	765.3092	553.0857	339.0871	204.2053	210.7159	395.8452	649.6714	883.0948	1080.5317	(97)
Space heating kWh													
	243.2583	152.0365	75.5340	14.2964	1.3105	0.0000	0.0000	0.0000	0.0000	18.9736	121.2311	260.7053	(98a)
Space heating requirement - total per year (kWh/year)												887.3456	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	243.2583	152.0365	75.5340	14.2964	1.3105	0.0000	0.0000	0.0000	0.0000	18.9736	121.2311	260.7053	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												887.3456	
Space heating per m2											(98c) / (4) =	8.7995	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

```
Space heating requirement
            243.2583   152.0365    75.5340    14.2964     1.3105     0.0000     0.0000     0.0000     0.0000    18.9736   121.2311   260.7053 (98)
Space heating efficiency (main heating system 1)
            100.0000   100.0000   100.0000   100.0000   100.0000     0.0000     0.0000     0.0000     0.0000   100.0000   100.0000   100.0000 (210)
Space heating fuel (main heating system)
            243.2583   152.0365    75.5340    14.2964     1.3105     0.0000     0.0000     0.0000     0.0000    18.9736   121.2311   260.7053 (211)
Space heating efficiency (main heating system 2)
              0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (212)
Space heating fuel (main heating system 2)
              0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (213)
Space heating fuel (secondary)
              0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (215)
Space heating fuel used, main system 2                                                                                                  0.0000 (213)

Water heating
Water heating requirement
            256.3909   226.2864   239.2442   207.5867   199.3536   177.5954   173.7876   181.8249   185.0789   208.8225   225.0355   253.2280 (64)
Efficiency of water heater                                                                                                              361.6650 (216)
(217)m      361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650 (217)
Fuel for water heating, kWh/month
             70.8918    62.5679    66.1508    57.3975    55.1211    49.1050    48.0521    50.2744    51.1741    57.7392    62.2221    70.0173 (219)
Space cooling fuel requirement
(221)m        0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (221)
Pumps and Fa   16.3195    14.7402    16.3195    15.7931    16.3195    15.7931    16.3195    16.3195    15.7931    16.3195    15.7931    16.3195 (231)
Lighting       26.5742    21.3188    19.1952    14.0633    10.8629     8.8751     9.9095    12.8807    16.7308    21.9517    24.7944    27.3128 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m       0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1                                                                                                    887.3456 (211)
Space heating fuel - main system 2                                                                                                      0.0000 (213)
Space heating fuel - secondary                                                                                                          0.0000 (215)
Efficiency of water heater                                                                                                            361.6650
Water heating fuel used                                                                                                               700.7133 (219)
Space cooling fuel                                                                                                                      0.0000 (221)

Electricity for pumps and fans:
    (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)
   mechanical ventilation fans (SFP =       0.6125)                                                                                     192.1493 (230a)
Total electricity for the above, kWh/year                                                                                             192.1493 (231)
Electricity for lighting (calculated in Appendix L)                                                                                   214.4693 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation                                                                                                                           0.0000 (233)
Wind generation                                                                                                                         0.0000 (234)
Hydro-electric generation (Appendix N)                                                                                                  0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)                                                                                          0.0000 (235)
Appendix Q - special features
Energy saved or generated                                                                                                              -0.0000 (236)
Energy used                                                                                                                             0.0000 (237)
Total delivered energy for all uses                                                                                                  1994.6775 (238)


-------------------------------------------------------------------------------------------------------
10a. Fuel costs - using BEDF prices (593)
-------------------------------------------------------------------------------------------------------
                                                                  Fuel          Fuel price          Fuel cost
                                                               kWh/year             p/kWh             £/year
Space heating - main system 1                                 887.3456            27.6700          245.5285 (240)
Space heating - main system 2                                   0.0000            27.6700            0.0000 (241)
Total CO2 associated with community systems                                                          0.0000 (473)
Water heating (other fuel)                                    700.7133            27.6700          193.8874 (247)
Energy for instantaneous electric shower(s)                     0.0000            27.6700            0.0000 (247a)
Pumps, fans and electric keep-hot                             192.1493            27.6700           53.1677 (249)
Energy for lighting                                           214.4693            27.6700           59.3436 (250)
Additional standing charges                                                                          0.0000 (251)
Total energy cost                                                                                  551.9273 (255)


-------------------------------------------------------------------------------------------------------
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP
-------------------------------------------------------------------------------------------------------
                                                                  Energy  Emission factor       Emissions
                                                               kWh/year       kg CO2/kWh     kg CO2/year
Space heating - main system 1                                 887.3456           0.1590        141.1323 (261)
Space heating - main system 2                                   0.0000           0.0000          0.0000 (262)
Total CO2 associated with community systems                                                          0.0000 (373)
Water heating (other fuel)                                    700.7133           0.1412         98.9324 (264)
Space and water heating                                                                            240.0646 (265)
Pumps, fans and electric keep-hot                             192.1493           0.1387         26.6535 (267)
Energy for lighting                                           214.4693           0.1443         30.9545 (268)
Total CO2, kg/year                                                                                 297.6727 (272)


-------------------------------------------------------------------------------------------------------
13a. Primary energy - Individual heating systems including micro-CHP
-------------------------------------------------------------------------------------------------------
                                                                  Energy Primary energy factor  Primary energy
                                                               kWh/year       kg CO2/kWh          kWh/year
Space heating - main system 1                                 887.3456           1.5887       1409.7390 (275)
Space heating - main system 2                                   0.0000           0.0000          0.0000 (276)
Total CO2 associated with community systems                                                          0.0000 (473)
Water heating (other fuel)                                    700.7133           1.5221       1066.5393 (278)
Space and water heating                                                                           2476.2783 (279)
Pumps, fans and electric keep-hot                             192.1493           1.5128        290.6835 (281)
```

Energy for lighting	214.4693	1.5338	328.9601 (282)
Total Primary energy kWh/year			3095.9220 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 85
Current environmental impact rating: A 97

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 85
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£552	£552	£0
Space heating	£299	£299	£0
Water heating	£194	£194	£0
Lighting	£59	£59	£0
Total cost of fuels	£552	£552	£0
Total cost of uses	£552	£552	£0
Delivered energy	20 kWh/m²	20 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	31 kWh/m²	31 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.8400	(1b)	x 2.5500	(2b)	= 257.1420	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8400					(4)
Dwelling volume					= 257.1420	(5)

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2. Ventilation rate

---

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5300 (17)
Infiltration rate		0.1265 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1075 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1371	0.1344	0.1317	0.1183	0.1156	0.1021	0.1021	0.0995	0.1075	0.1156	0.1210	0.1263	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.0000 (23c)

Effective ac	0.2771	0.2744	0.2717	0.2583	0.2556	0.2421	0.2421	0.2395	0.2475	0.2556	0.2610	0.2663 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			16.3500	1.2357	20.2044			(27)
Brickwork	84.3500	20.6900	63.6600	0.2100	13.3686	110.0000	7002.5998	(29a)
Communal Wall	6.5200	2.0600	4.4600	0.2200	0.9812	110.0000	490.6000	(29a)
Stairwell Wall	7.6100		7.6100	0.2500	1.9025	110.0000	837.1000	(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.8981			(33)
Main dwelling								
Party Wall 1			38.3000	0.0000	0.0000	110.0000	4212.9999	(32)
Party Floor 1			100.8400			70.0000	7058.8000	(32d)
Party Ceiling 1			100.8400			30.0000	3025.2000	(32b)
Internal Wall 1			207.0000			9.0000	1863.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24490.2998 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.8630 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	73.8100	0.0380	2.8048
E16 Corner (normal)	14.4000	0.0540	0.7776
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	37.6900	0.0160	0.6030
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	1.5700	0.3300	0.5181
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4587 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.3568 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.5134	23.2853	23.0571	21.9166	21.6885	20.5480	20.5480	20.3199	21.0042	21.6885	22.1447	22.6009	(38)
Heat transfer coeff	74.8701	74.6420	74.4139	73.2734	73.0453	71.9048	71.9048	71.6767	72.3610	73.0453	73.5015	73.9577	(39)
Average = Sum(39)m / 12 =												73.2164	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7425	0.7402	0.7379	0.7266	0.7244	0.7131	0.7131	0.7108	0.7176	0.7244	0.7289	0.7334	(40)
HLP (average)												0.7261	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7472 (42)
Hot water usage for mixer showers

70.2807	69.2246	67.6855	64.7408	62.5676	60.1442	58.7667	60.2941	61.9684	64.5705	67.5785	70.0115	(42a)

Hot water usage for baths

30.3462	29.8956	29.2609	28.0907	27.2145	26.2429	25.7181	26.3483	27.0345	28.0741	29.2684	30.2437	(42b)

Hot water usage for other uses

42.7637	41.2087	39.6536	38.0986	36.5436	34.9885	34.9885	36.5436	38.0986	39.6536	41.2087	42.7637	(42c)

Average daily hot water use (litres/day) 131.8084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.3907	140.3288	136.6000	130.9301	126.3257	121.3756	119.4733	123.1860	127.1015	132.2983	138.0556	143.0189	(44)
Energy conte	227.0959	199.8264	209.9492	179.2367	170.0586	149.2454	144.4926	152.5299	156.7289	179.5275	196.6855	223.9330	(45)
Energy content (annual)										Total = Sum(45)m =		2189.3096	

Distribution loss (46)m = 0.15 x (45)m

34.0644	29.9740	31.4924	26.8855	25.5088	22.3868	21.6739	22.8795	23.5093	26.9291	29.5028	33.5899	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(64)
									Total per year (kWh/year) = Sum(64)m =			2534.2346	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

75.5094	66.4423	69.8081	59.5962	56.5445	49.6241	48.0438	50.7162	52.1124	59.6929	65.3979	74.4577	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.3603	26.9658	21.9301	16.6025	12.4105	10.4775	11.3213	14.7159	19.7516	25.0792	29.2711	31.2042	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	384.5950	388.5859	378.5289	357.1189	330.0927	304.6918	287.7224	283.7316	293.7885	315.1985	342.2247	367.6256	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	(71)
Water heating gains (Table 5)													
	101.4911	98.8724	93.8281	82.7725	76.0007	68.9224	64.5750	68.1669	72.3783	80.2324	90.8305	100.0776	(72)
Total internal gains													
	625.6199	623.5976	603.4606	565.6674	527.6774	493.2652	472.7922	475.7879	495.0919	529.6835	571.4998	608.0809	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	19.6403	0.3300	0.0000	0.7700	21.6592	(80)
Northeast	2.1800	11.2829	0.3100	0.0000	0.7700	5.8713	(75)
East	4.9100	19.6403	0.3100	0.0000	0.7700	23.0187	(76)
Southeast	6.8000	36.7938	0.3100	0.0000	0.7700	59.7223	(77)
South	2.4600	46.7521	0.3100	0.0000	0.7700	27.4529	(78)

Solar gains	137.7243	246.0405	361.9288	482.4750	565.4239	570.7220	546.4495	484.1990	404.1799	279.2388	167.1702	116.3673	(83)
Total gains	763.3442	869.6380	965.3894	1048.1424	1093.1012	1063.9872	1019.2417	959.9868	899.2718	808.9223	738.6700	724.4482	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	90.8621	91.1398	91.4192	92.8422	93.1321	94.6093	94.6093	94.9104	94.0128	93.1321	92.5540	91.9831	
alpha	7.0575	7.0760	7.0946	7.1895	7.2088	7.3073	7.3073	7.3274	7.2675	7.2088	7.1703	7.1322	
util living area													
	0.9878	0.9698	0.9195	0.7934	0.6137	0.4320	0.3104	0.3434	0.5518	0.8489	0.9709	0.9910	(86)
MIT	20.4159	20.5780	20.7746	20.9351	20.9900	20.9993	20.9999	20.9999	20.9963	20.9138	20.6406	20.3815	(87)
Th 2	20.3035	20.3055	20.3074	20.3174	20.3194	20.3293	20.3293	20.3313	20.3253	20.3194	20.3154	20.3114	(88)
util rest of house													
	0.9845	0.9623	0.9020	0.7603	0.5714	0.3870	0.2631	0.2935	0.4993	0.8139	0.9624	0.9885	(89)
MIT 2	19.6289	19.8324	20.0706	20.2573	20.3117	20.3289	20.3293	20.3313	20.3231	20.2412	19.9209	19.5921	(90)
Living area fraction										fLA = Living area / (4) =		0.3609	(91)
MIT	19.9129	20.1015	20.3246	20.5019	20.5565	20.5709	20.5713	20.5726	20.5660	20.4839	20.1806	19.8769	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9129	20.1015	20.3246	20.5019	20.5565	20.5709	20.5713	20.5726	20.5660	20.4839	20.1806	19.8769	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9823	0.9597	0.9025	0.7696	0.5862	0.4032	0.2801	0.3115	0.5181	0.8229	0.9604	0.9866	(94)
Useful gains	749.8196	834.6314	871.2272	806.6475	640.8217	428.9956	285.5376	299.0349	465.9342	665.6332	709.4174	714.7396	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1168.9402	1134.6700	1028.7442	850.1100	646.9223	429.3333	285.5564	299.0749	467.8882	721.9726	961.4453	1159.4311	(97)
Space heating kWh													
	311.8258	201.6259	117.1927	31.2930	4.5389	0.0000	0.0000	0.0000	0.0000	41.9165	181.4601	330.8505	(98a)
Space heating requirement - total per year (kWh/year)												1220.7033	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	311.8258	201.6259	117.1927	31.2930	4.5389	0.0000	0.0000	0.0000	0.0000	41.9165	181.4601	330.8505	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1220.7033	
Space heating per m2										(98c) / (4) =		12.1053	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	311.8258	201.6259	117.1927	31.2930	4.5389	0.0000	0.0000	0.0000	0.0000	41.9165	181.4601	330.8505	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	311.8258	201.6259	117.1927	31.2930	4.5389	0.0000	0.0000	0.0000	0.0000	41.9165	181.4601	330.8505	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating

Water heating requirement

	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	70.8918	62.5679	66.1508	57.3975	55.1211	49.1050	48.0521	50.2744	51.1741	57.7392	62.2221	70.0173	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.3195	14.7402	16.3195	15.7931	16.3195	15.7931	16.3195	16.3195	15.7931	16.3195	15.7931	16.3195	(231)
Lighting	26.5742	21.3188	19.1952	14.0633	10.8629	8.8751	9.9095	12.8807	16.7308	21.9517	24.7944	27.3128	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1220.7033	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	700.7133	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	192.1493	(230a)
Total electricity for the above, kWh/year	192.1493	(231)
Electricity for lighting (calculated in Appendix L)	214.4693	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2328.0352	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1220.7033	16.4900	201.2940	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	700.7133	16.4900	115.5476	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	192.1493	16.4900	31.6854	(249)
Energy for lighting	214.4693	16.4900	35.3660	(250)
Additional standing charges			0.0000	(251)
Total energy cost			383.8930	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9476	(257)
SAP value		84.6390	
SAP rating (Section 12)		85	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1220.7033	0.1582	193.1220	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	700.7133	0.1412	98.9324	(264)
Space and water heating			292.0544	(265)
Pumps, fans and electric keep-hot	192.1493	0.1387	26.6535	(267)
Energy for lighting	214.4693	0.1443	30.9545	(268)
Total CO2, kg/year			349.6624	(272)
CO2 emissions per m2			3.4700	(273)
EI value			96.7872	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.8400 (1b)	x	2.5500 (2b)	=	257.1420	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	257.1420	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5300	(17)
Infiltration rate		0.1265	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1075	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1156	0.1102	0.1102	0.1021	0.1048	0.0914	0.0914	0.0887	0.0914	0.1021	0.0995	0.1075	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2556	0.2502	0.2502	0.2421	0.2448	0.2314	0.2314	0.2287	0.2314	0.2421	0.2395	0.2475	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			16.3500	1.2357	20.2044			(27)
Brickwork	84.3500	20.6900	63.6600	0.2100	13.3686	110.0000	7002.5998	(29a)
Communal Wall	6.5200	2.0600	4.4600	0.2200	0.9812	110.0000	490.6000	(29a)
Stairwell Wall	7.6100		7.6100	0.2500	1.9025	110.0000	837.1000	(29a)
Total net area of external elements Aum(A, m2)			98.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.8981			(33)
Main dwelling								
Party Wall 1			38.3000	0.0000	0.0000	110.0000	4212.9999	(32)
Party Floor 1			100.8400			70.0000	7058.8000	(32d)
Party Ceiling 1			100.8400			30.0000	3025.2000	(32b)
Internal Wall 1			207.0000			9.0000	1863.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	24490.2998 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		242.8630 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	73.8100	0.0380	2.8048
E16 Corner (normal)	14.4000	0.0540	0.7776
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	37.6900	0.0160	0.6030
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	1.5700	0.3300	0.5181
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.4587 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	51.3568 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.6885	21.2323	21.2323	20.5480	20.7761	19.6356	19.6356	19.4075	19.6356	20.5480	20.3199	21.0042	(38)
Heat transfer coeff	73.0453	72.5891	72.5891	71.9048	72.1329	70.9923	70.9923	70.7642	70.9923	71.9048	71.6767	72.3610	(39)
Average = Sum(39)m / 12 =												71.8287	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7244	0.7198	0.7198	0.7131	0.7153	0.7040	0.7040	0.7017	0.7040	0.7131	0.7108	0.7176	(40)
HLP (average)												0.7123	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7472 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
70.2807	69.2246	67.6855	64.7408	62.5676	60.1442	58.7667	60.2941	61.9684	64.5705	67.5785	70.0115	(42a)

Hot water usage for baths

	30.3462	29.8956	29.2609	28.0907	27.2145	26.2429	25.7181	26.3483	27.0345	28.0741	29.2684	30.2437	(42b)
Hot water usage for other uses													
	42.7637	41.2087	39.6536	38.0986	36.5436	34.9885	34.9885	36.5436	38.0986	39.6536	41.2087	42.7637	(42c)
Average daily hot water use (litres/day)												131.8084	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.3907	140.3288	136.6000	130.9301	126.3257	121.3756	119.4733	123.1860	127.1015	132.2983	138.0556	143.0189	(44)
Energy conte	227.0959	199.8264	209.9492	179.2367	170.0586	149.2454	144.4926	152.5299	156.7289	179.5275	196.6855	223.9330	(45)
Energy content (annual)										Total = Sum(45)m =		2189.3096	
Distribution loss (46)m = 0.15 x (45)m													
	34.0644	29.9740	31.4924	26.8855	25.5088	22.3868	21.6739	22.8795	23.5093	26.9291	29.5028	33.5899	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(64)
										Total per year (kWh/year) = Sum(64)m =		2534.2346	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	75.5094	66.4423	69.8081	59.5962	56.5445	49.6241	48.0438	50.7162	52.1124	59.6929	65.3979	74.4577	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	164.8300	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.3603	26.9658	21.9301	16.6025	12.4105	10.4775	11.3213	14.7159	19.7516	25.0792	29.2711	31.2042	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	384.5950	388.5859	378.5289	357.1189	330.0927	304.6918	287.7224	283.7316	293.7885	315.1985	342.2247	367.6256	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	54.2302	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	-109.8867	(71)
Water heating gains (Table 5)													
	101.4911	98.8724	93.8281	82.7725	76.0007	68.9224	64.5750	68.1669	72.3783	80.2324	90.8305	100.0776	(72)
Total internal gains													
	625.6199	623.5976	603.4606	565.6674	527.6774	493.2652	472.7922	475.7879	495.0919	529.6835	571.4998	608.0809	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	23.8018	0.3300	0.0000	0.7700	26.2484	(80)
Northeast	2.1800	13.7804	0.3100	0.0000	0.7700	7.1709	(75)
East	4.9100	23.8018	0.3100	0.0000	0.7700	27.8961	(76)
Southeast	6.8000	43.0593	0.3100	0.0000	0.7700	69.8921	(77)
South	2.4600	54.2217	0.3100	0.0000	0.7700	31.8391	(78)

Solar gains	163.0466	254.7719	372.8971	506.4376	579.9448	620.0086	587.4584	532.4304	444.4966	310.5629	195.0037	138.5335	(83)
Total gains	788.6665	878.3695	976.3577	1072.1050	1107.6222	1113.2737	1060.2506	1008.2183	939.5885	840.2464	766.5035	746.6144	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	93.1321	93.7174	93.7174	94.6093	94.3101	95.8253	95.8253	96.1342	95.8253	94.6093	94.9104	94.0128	
alpha	7.2088	7.2478	7.2478	7.3073	7.2873	7.3884	7.3884	7.4089	7.3884	7.3073	7.3274	7.2675	
util living area													
	0.9794	0.9554	0.8836	0.7204	0.5251	0.3315	0.2210	0.2386	0.4526	0.7722	0.9472	0.9844	(86)
MIT	20.5405	20.6790	20.8527	20.9694	20.9969	20.9999	21.0000	21.0000	20.9992	20.9594	20.7563	20.5084	(87)
Th 2	20.3194	20.3233	20.3233	20.3293	20.3273	20.3373	20.3373	20.3393	20.3373	20.3293	20.3313	20.3253	(88)
util rest of house													
	0.9740	0.9447	0.8605	0.6832	0.4824	0.2893	0.1766	0.1923	0.4030	0.7292	0.9327	0.9801	(89)
MIT 2	19.7986	19.9718	20.1747	20.3028	20.3252	20.3373	20.3373	20.3393	20.3369	20.2956	20.0745	19.7638	(90)
Living area fraction										fLA = Living area / (4) =		0.3609	(91)
MIT	20.0663	20.2270	20.4194	20.5434	20.5676	20.5764	20.5764	20.5777	20.5759	20.5352	20.3205	20.0325	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0663	20.2270	20.4194	20.5434	20.5676	20.5764	20.5764	20.5777	20.5759	20.5352	20.3205	20.0325	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9716	0.9429	0.8640	0.6953	0.4978	0.3046	0.1926	0.2090	0.4209	0.7428	0.9324	0.9779	(94)
Useful gains	766.2603	828.2566	843.5418	745.4530	551.3243	339.0509	204.2045	210.7143	395.4592	624.1692	714.7183	730.1214	(95)

Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1093.2203	1054.5015	945.0659	765.3092	553.0857	339.0871	204.2053	210.7159	395.8452	649.6714	883.0948	1080.5317	(97)
Space heating kWh	243.2583	152.0365	75.5340	14.2964	1.3105	0.0000	0.0000	0.0000	0.0000	18.9736	121.2311	260.7053	(98a)
Space heating requirement - total per year (kWh/year)												887.3456	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	243.2583	152.0365	75.5340	14.2964	1.3105	0.0000	0.0000	0.0000	0.0000	18.9736	121.2311	260.7053	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												887.3456	
Space heating per m2											(98c) / (4) =	8.7995	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	243.2583	152.0365	75.5340	14.2964	1.3105	0.0000	0.0000	0.0000	0.0000	18.9736	121.2311	260.7053	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	243.2583	152.0365	75.5340	14.2964	1.3105	0.0000	0.0000	0.0000	0.0000	18.9736	121.2311	260.7053	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	256.3909	226.2864	239.2442	207.5867	199.3536	177.5954	173.7876	181.8249	185.0789	208.8225	225.0355	253.2280	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	70.8918	62.5679	66.1508	57.3975	55.1211	49.1050	48.0521	50.2744	51.1741	57.7392	62.2221	70.0173	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.3195	14.7402	16.3195	15.7931	16.3195	15.7931	16.3195	16.3195	15.7931	16.3195	15.7931	16.3195	(231)
Lighting	26.5742	21.3188	19.1952	14.0633	10.8629	8.8751	9.9095	12.8807	16.7308	21.9517	24.7944	27.3128	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	887.3456	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	700.7133	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	192.1493	(230a)
Total electricity for the above, kWh/year	192.1493	(231)
Electricity for lighting (calculated in Appendix L)	214.4693	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1994.6775	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	887.3456	27.6700	245.5285	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	700.7133	27.6700	193.8874	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	192.1493	27.6700	53.1677	(249)
Energy for lighting	214.4693	27.6700	59.3436	(250)
Additional standing charges			0.0000	(251)
Total energy cost			551.9273	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	887.3456	0.1590	141.1323	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	700.7133	0.1412	98.9324	(264)
Space and water heating			240.0646	(265)
Pumps, fans and electric keep-hot	192.1493	0.1387	26.6535	(267)
Energy for lighting	214.4693	0.1443	30.9545	(268)
Total CO2, kg/year			297.6727	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	887.3456	1.5887	1409.7390	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	700.7133	1.5221	1066.5393	(278)
Space and water heating			2476.2783	(279)
Pumps, fans and electric keep-hot	192.1493	1.5128	290.6835	(281)
Energy for lighting	214.4693	1.5338	328.9601	(282)
Total Primary energy kWh/year			3095.9220	(286)

Summary for Input Data

Plot Reference	P-25	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-25
Plot Address	Flat 5, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	5.61	**TER**	15.51
Environmental	96 A	**% DER < TER**			63.83
CO_2 Emissions (t/year)	0.23	**DFEE**	39.39	**TFEE**	38.96
Compliance Check	See BREL	**% DFEE < TFEE**			-1.10
% DPER < TPER	29.85	**DPER**	57.98	**TPER**	82.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	306.67	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	16.77 m	51.65 m²	2.55 m

8.0 Living Area	25.47	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	41.46	30.59	0.00	None	10.87	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.82	4.76	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	34.66	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	100.70

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	51.65

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)

Summary for Input Data

Exposed Floor	Exposed Floor - Solid	Lowest occupied	Other		0.14	Garage Single 1 Inside	0.70	110.00	51.65

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	East	2.06	
Patio Door	Patio Door	Brickwork	West	5.42	
West	Window	Brickwork	West	2.72	
South	Window	Brickwork	South	2.72	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	16.76	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	5.76	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	12.04	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	2.70	0.33	0.33	Abbey Calculated	No
E2 Other lintels (including other steel lintels)	Independently assessed	5.55	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.49	0.02	0.02	RCD	No
E20 Exposed floor (normal)	Independently assessed	14.06	0.12	0.12	-	No
P8 Party Wall - Exposed floor (inverted)	Independently assessed	5.20	0.32	0.32	2/3TableK1	No
E16 Corner (normal)	Gov Approved Scheme	2.88	0.05	0.05	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.88	0.03	0.03	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.85	-0.10	-0.10	RCD	No
P7 Party Wall - Exposed floor (normal)	Table K1 - Default	6.83	0.48	0.48	-	No

Y-value	0.09	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0

Summary for Input Data

Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.99	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To

Above Bath	Combi boiler or unvented hot water system	8.00	No
Ensuite	Combi boiler or unvented hot water system	8.00	No

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-25	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-25
Plot Address	Flat 5, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	5.61	**TER**	15.51
Environmental	96 A	**% DER < TER**			63.83
CO_2 Emissions (t/year)	0.23	**DFEE**	39.39	**TFEE**	38.96
Compliance Check	See BREL	**% DFEE < TFEE**			-1.10
% DPER < TPER	29.85	**DPER**	57.98	**TPER**	82.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	131.7075	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9900	(17)
Infiltration rate		0.1495	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1271	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1620	0.1588	0.1557	0.1398	0.1366	0.1207	0.1207	0.1175	0.1271	0.1366	0.1430	0.1493	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000	(23c)
Effective ac	0.2980	0.2948	0.2917	0.2758	0.2726	0.2567	0.2567	0.2535	0.2631	0.2726	0.2790	0.2853	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Exposed Floor			51.6500	0.1275	6.5856	110.0000	5681.5000	(28b)
Brickwork	41.4600	10.8600	30.6000	0.2100	6.4260	110.0000	3365.9999	(29a)
Communal Wall	6.8200	2.0600	4.7600	0.2200	1.0472	110.0000	523.6000	(29a)
Total net area of external elements Aum(A, m2)			99.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.9659			(33)
Main dwelling								
Party Wall 1			34.6600	0.0000	0.0000	110.0000	3812.6000	(32)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			100.7000			9.0000	906.3000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15839.4999	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							306.6699	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.7600	0.0380	0.6369
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	14.0600	0.1200	1.6872
P8 Party Wall - Exposed floor (inverted)	5.2000	0.3200	1.6640
E16 Corner (normal)	2.8800	0.0540	0.1555
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
P7 Party Wall - Exposed floor (normal)	6.8300	0.4800	3.2784

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9181 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.8840 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9530	12.8149	12.6769	11.9865	11.8484	11.1580	11.1580	11.0199	11.4342	11.8484	12.1245	12.4007	(38)
Heat transfer coeff	50.8370	50.6989	50.5608	49.8704	49.7324	49.0420	49.0420	48.9039	49.3181	49.7324	50.0085	50.2847	(39)

Average = Sum(39)m / 12 = 49.8359

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9843	0.9816	0.9789	0.9655	0.9629	0.9495	0.9495	0.9468	0.9549	0.9629	0.9682	0.9736	(40)
HLP (average)												0.9649	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)
Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)

Energy content (annual) Total = Sum(45)m = 1662.4694

Distribution loss (46)m = 0.15 x (45)m												
25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)

Total per year (kWh/year) = Sum(64)m = 2007.3944 (64)
12Total per year (kWh/year) 2007 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains	354.2931	362.0874	346.0852	331.8094	313.4656	300.6378	288.0966	289.2516	298.9655	310.8102	332.0596	346.5342	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)

South			2.7200		46.7521		0.3300		0.0000		0.7700		32.3128 (78)
West			2.7200		19.6403		0.3300		0.0000		0.7700		13.5744 (80)
Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	427.2292	494.4754	544.3684	598.8678	626.7770	616.4998	590.7218	557.5747	521.5941	462.1848	421.0139	407.8622	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.5484	86.7841	87.0211	88.2258	88.4708	89.7162	89.7162	89.9695	89.2139	88.4708	87.9822	87.4990	
alpha	6.7699	6.7856	6.8014	6.8817	6.8981	6.9811	6.9811	6.9980	6.9476	6.8981	6.8655	6.8333	
util living area	0.9952	0.9866	0.9623	0.8764	0.7118	0.5069	0.3651	0.4030	0.6403	0.9168	0.9871	0.9964	(86)
MIT	20.2345	20.4065	20.6217	20.8576	20.9703	20.9975	20.9998	20.9996	20.9886	20.8306	20.4938	20.2068	(87)
Th 2	20.0965	20.0987	20.1009	20.1121	20.1144	20.1256	20.1256	20.1279	20.1211	20.1144	20.1099	20.1054	(88)
util rest of house	0.9934	0.9818	0.9493	0.8412	0.6534	0.4388	0.2927	0.3269	0.5644	0.8834	0.9816	0.9951	(89)
MIT 2	19.2189	19.4376	19.7045	19.9835	20.0936	20.1245	20.1256	20.1278	20.1151	19.9635	19.5584	19.1908	(90)
Living area fraction									fLA = Living area / (4) =			0.4931	(91)
MIT	19.7197	19.9154	20.1568	20.4145	20.5259	20.5550	20.5567	20.5577	20.5458	20.3911	20.0197	19.6918	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7197	19.9154	20.1568	20.4145	20.5259	20.5550	20.5567	20.5577	20.5458	20.3911	20.0197	19.6918	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9925	0.9806	0.9502	0.8541	0.6812	0.4724	0.3284	0.3645	0.6017	0.8950	0.9809	0.9942	(94)
Useful gains	424.0078	484.8686	517.2679	511.4650	426.9469	291.2073	193.9878	203.2155	313.8374	413.6400	412.9864	405.5129	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	783.8921	761.2656	690.4970	574.2352	438.9343	292.0439	194.0427	203.3265	317.8967	486.9338	646.0944	779.0002	(97)
Space heating kWh	267.7539	185.7388	128.8825	45.1946	8.9186	0.0000	0.0000	0.0000	0.0000	54.5306	167.8378	277.8746	(98a)
Space heating requirement - total per year (kWh/year)												1136.7314	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.7539	185.7388	128.8825	45.1946	8.9186	0.0000	0.0000	0.0000	0.0000	54.5306	167.8378	277.8746	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1136.7314	
Space heating per m2											(98c) / (4) =	22.0084	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	267.7539	185.7388	128.8825	45.1946	8.9186	0.0000	0.0000	0.0000	0.0000	54.5306	167.8378	277.8746	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	267.7539	185.7388	128.8825	45.1946	8.9186	0.0000	0.0000	0.0000	0.0000	54.5306	167.8378	277.8746	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1136.7314	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.4014	(230a)
Total electricity for the above, kWh/year	94.4014	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1922.4124	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1136.7314	0.1573	178.7744	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			257.0830	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			289.8408	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1136.7314	1.5822	1798.5372	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)
Space and water heating			2643.1414	(279)
Pumps, fans and electric keep-hot	94.4014	1.5128	142.8104	(281)
Energy for lighting	136.2372	1.5338	208.9651	(282)
Total Primary energy kWh/year			2994.9169	(286)
Dwelling Primary energy Rate (DPER)			57.9800	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b) x	2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.7075	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1519	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4019	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3416	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4355	0.4270	0.4184	0.3757	0.3672	0.3245	0.3245	0.3160	0.3416	0.3672	0.3843	0.4013	(22b)
Effective ac	0.5948	0.5912	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8600	1.1450	12.4351			(27)
Exposed Floor			51.6500	0.1300	6.7145			(28b)
Brickwork	41.4600	10.8600	30.6000	0.1800	5.5080			(29a)
Communal Wall	6.8200	2.0600	4.7600	0.1800	0.8568			(29a)
Total net area of external elements Aum(A, m2)			99.9300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.5744			(33)
Main dwelling								
Party Wall 1			34.6600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 306.6699 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	16.7600	0.0700	1.1732	
E18 Party wall between dwellings	5.7600	0.0600	0.3456	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.0200	0.0540	
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775	
E4 Jamb	18.4900	0.0500	0.9245	
E20 Exposed floor (normal)	14.0600	0.3200	4.4992	
P8 Party Wall - Exposed floor (inverted)	5.2000	0.2400	1.2480	
E16 Corner (normal)	2.8800	0.0900	0.2592	
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565	
P7 Party Wall - Exposed floor (normal)	6.8300	0.1600	1.0928	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7903 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 37.3647 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.8535	25.6935	25.5366	24.7997	24.6618	24.0200	24.0200	23.9012	24.2672	24.6618	24.9407	25.2323	(38)
Heat transfer coeff	63.2182	63.0582	62.9013	62.1644	62.0265	61.3847	61.3847	61.2659	61.6320	62.0265	62.3054	62.5970	(39)
Average = Sum(39)m / 12 =												62.1637	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2240	1.2209	1.2178	1.2036	1.2009	1.1885	1.1885	1.1862	1.1933	1.2009	1.2063	1.2119	(40)
HLP (average)												1.2036	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m													
	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	219.0409	193.8256	206.0225	181.1975	175.7315	158.4238	156.3170	162.4195	164.1044	182.9195	194.4456	216.6389	(62)
WWHRS	-24.3997	-21.5793	-22.5966	-18.7109	-17.4379	-14.9217	-13.9867	-14.8735	-15.4386	-18.2004	-20.6188	-23.9478	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
										Total per year (kWh/year) = Sum(64)m =		1984.3750	(64)
12Total per year (kWh/year)												1984	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	94.6142	84.1221	90.2856	81.3286	80.2138	73.7564	73.7585	75.7876	75.6451	82.6039	85.7336	93.8156	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	127.1696	125.1817	121.3516	112.9564	107.8143	102.4394	99.1378	101.8651	105.0627	111.0267	119.0744	126.0962	(72)
Total internal gains													
	407.3951	415.1894	399.1873	384.9114	366.5676	350.7398	338.1986	339.3536	349.0676	363.9122	385.1616	399.6363	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.7200	46.7521	0.6300	0.7000	0.7700	38.8635	(78)
West	8.1400	19.6403	0.6300	0.7000	0.7700	48.8589	(80)

Solar gains	87.7223	159.2267	238.4806	321.1985	376.8282	379.8959	363.9756	322.7195	267.7615	182.0625	106.9877	73.7608	(83)
Total gains	495.1174	574.4161	637.6679	706.1099	743.3958	730.6357	702.1742	662.0732	616.8290	545.9747	492.1494	473.3971	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.5980	69.7746	69.9487	70.7778	70.9351	71.6768	71.6768	71.8158	71.3893	70.9351	70.6176	70.2887	
alpha	5.6399	5.6516	5.6632	5.7185	5.7290	5.7785	5.7785	5.7877	5.7593	5.7290	5.7078	5.6859	
util living area													
	0.9925	0.9822	0.9563	0.8767	0.7263	0.5307	0.3837	0.4239	0.6621	0.9124	0.9825	0.9941	(86)
MIT	20.0180	20.2148	20.4736	20.7676	20.9355	20.9911	20.9988	20.9980	20.9705	20.7434	20.3325	19.9871	(87)
Th 2	19.9009	19.9033	19.9058	19.9171	19.9193	19.9292	19.9292	19.9311	19.9254	19.9193	19.9150	19.9105	(88)
util rest of house													
	0.9897	0.9757	0.9407	0.8379	0.6588	0.4453	0.2909	0.3264	0.5710	0.8746	0.9748	0.9918	(89)
MIT 2	18.7928	19.0419	19.3618	19.7083	19.8744	19.9253	19.9290	19.9306	19.9101	19.6939	19.2014	18.7608	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.3969	19.6202	19.9100	20.2306	20.3977	20.4509	20.4565	20.4569	20.4330	20.2115	19.7592	19.3655	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3969	19.6202	19.9100	20.2306	20.3977	20.4509	20.4565	20.4569	20.4330	20.2115	19.7592	19.3655	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9880	0.9736	0.9408	0.8501	0.6898	0.4874	0.3367	0.3746	0.6153	0.8861	0.9734	0.9903	(94)
Useful gains	489.1586	559.2598	599.8979	600.2646	512.8260	356.1134	236.4399	248.0161	379.5544	483.7972	479.0603	468.8123	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	954.4022	928.2317	843.5078	704.3618	539.4856	359.1534	236.7333	248.5518	390.3153	596.1662	788.7361	949.3156	(97)
Space heating kWh													
	346.1412	247.9491	181.2458	74.9500	19.8347	0.0000	0.0000	0.0000	0.0000	83.6025	222.9666	357.4944	(98a)
Space heating requirement - total per year (kWh/year)												1534.1844	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	346.1412	247.9491	181.2458	74.9500	19.8347	0.0000	0.0000	0.0000	0.0000	83.6025	222.9666	357.4944	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1534.1844	
Space heating per m2											(98c) / (4) =	29.7035	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	346.1412	247.9491	181.2458	74.9500	19.8347	0.0000	0.0000	0.0000	0.0000	83.6025	222.9666	357.4944	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	375.0176	268.6339	196.3659	81.2026	21.4894	0.0000	0.0000	0.0000	0.0000	90.5770	241.5672	387.3179	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3360	84.8761	84.0330	82.4374	80.7109	79.8000	79.8000	79.8000	79.8000	82.6191	84.6192	85.4257	(217)
Fuel for water heating, kWh/month													
	228.0881	202.9386	218.2785	197.1030	196.1243	179.8273	178.3588	184.8948	186.2980	199.3717	205.4224	225.5656	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9214	12.7728	11.5005	8.4257	6.5083	5.3173	5.9371	7.7172	10.0239	13.1519	14.8551	16.3640	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.9766	-20.7826	-31.4959	-37.4135	-42.1278	-39.9999	-39.5329	-36.4411	-31.2895	-24.6504	-15.7505	-11.9625	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.9299	-10.6083	-21.5278	-32.9858	-44.2484	-44.6716	-44.1257	-37.0541	-26.7727	-15.3613	-6.6443	-3.8795 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1662.1716	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2402.2712	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.4952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-638.2327	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3640.7053	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1662.1716	0.2100	349.0560	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2402.2712	0.2100	504.4770	(264)
Space and water heating			853.5330	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.4952	0.1443	18.5458	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	0.1335	-46.1008	
PV Unit electricity exported	-292.8094	0.1253	-36.6969	
Total			-82.7977	(269)
Total CO2, kg/year			801.2104	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1662.1716	1.1300	1878.2539	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2402.2712	1.1300	2714.5665	(278)
Space and water heating			4592.8204	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.4952	1.5338	197.0902	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	1.4932	-515.7819	
PV Unit electricity exported	-292.8094	0.4600	-134.6951	
Total			-650.4770	(283)
Total Primary energy kWh/year			4269.5344	(286)
Target Primary Energy Rate (TPER)			82.6600	(287)

Full SAP Calculation Printout

Plot Reference	P-25	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-25
Plot Address	Flat 5, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	5.61	**TER**	15.51
Environmental	96 A	**% DER < TER**			63.83
CO_2 Emissions (t/year)	0.23	**DFEE**	39.39	**TFEE**	38.96
Compliance Check	See BREL	**% DFEE < TFEE**			-1.10
% DPER < TPER	29.85	**DPER**	57.98	**TPER**	82.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	131.7075	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1519	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9900	(17)
Infiltration rate		0.3014	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2561	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3266	0.3202	0.3138	0.2818	0.2754	0.2433	0.2433	0.2369	0.2561	0.2754	0.2882	0.3010	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5533	0.5513	0.5492	0.5397	0.5379	0.5296	0.5296	0.5281	0.5328	0.5379	0.5415	0.5453	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Exposed Floor			51.6500	0.1275	6.5856	110.0000	5681.5000	(28b)
Brickwork	41.4600	10.8600	30.6000	0.2100	6.4260	110.0000	3365.9999	(29a)
Communal Wall	6.8200	2.0600	4.7600	0.2200	1.0472	110.0000	523.6000	(29a)
Total net area of external elements Aum(A, m2)			99.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.9659			(33)
Main dwelling								
Party Wall 1			34.6600	0.0000	0.0000	110.0000	3812.6000	(32)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			100.7000			9.0000	906.3000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15839.4999 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		306.6699 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.7600	0.0380	0.6369

E18 Party wall between dwellings	5.7600	0.0380	0.2189	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910	
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775	
E4 Jamb	18.4900	0.0160	0.2958	
E20 Exposed floor (normal)	14.0600	0.1200	1.6872	
P8 Party Wall - Exposed floor (inverted)	5.2000	0.3200	1.6640	
E16 Corner (normal)	2.8800	0.0540	0.1555	
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765	
P7 Party Wall - Exposed floor (normal)	6.8300	0.4800	3.2784	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9181 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.8840 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.0497	23.9597	23.8714	23.4570	23.3795	23.0186	23.0186	22.9517	23.1576	23.3795	23.5364	23.7003	(38)
Heat transfer coeff	61.9336	61.8436	61.7554	61.3410	61.2635	60.9026	60.9026	60.8357	61.0416	61.2635	61.4203	61.5843	(39)

Average = Sum(39)m / 12 = 61.3406

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1991	1.1974	1.1957	1.1876	1.1861	1.1791	1.1791	1.1778	1.1818	1.1861	1.1892	1.1923	(40)
HLP (average)												1.1876	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 50.8820 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5117	53.9894	52.3273	50.2580	48.4122	46.4939	46.0949	47.7536	49.4549	51.4249	53.5126	55.4336	(44)
Energy conte	87.9169	76.8803	80.4252	68.8007	65.1722	57.1697	55.7477	59.1289	60.9828	69.7831	76.2385	86.7957	(45)

Energy content (annual) Total = Sum(45)m = 845.0417

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(64)

Total per year (kWh/year) = Sum(64)m = 718.2855 (64)

12Total per year (kWh/year) 718 (64)

Electric shower(s)

42.7425	38.0839	41.5862	39.6852	40.4299	38.5662	39.8517	40.4299	39.6852	41.5862	40.8042	42.7425	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 486.1935 (64a)

Heat gains from water heating, kWh/month

29.3680	25.8580	27.4869	24.5415	23.9566	21.7901	21.8093	22.6724	22.8801	25.2255	26.4017	29.1297	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	39.4731	38.4792	36.9448	34.0854	32.1997	30.2640	29.3136	30.4736	31.7780	33.9052	36.6691	39.1528	(72)
Total internal gains	316.6985	325.4869	311.7804	303.0404	287.9530	278.5645	268.3745	267.9622	275.7829	283.7907	299.7563	309.6929	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
West	2.7200	19.6403	0.3300	0.0000	0.7700	13.5744	(80)

Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	389.6347	457.8750	510.0636	570.0988	601.2644	594.4265	570.9997	536.2853	498.4114	435.1654	388.7105	371.0209	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.0415	71.1449	71.2466	71.7279	71.8187	72.2443	72.2443	72.3236	72.0797	71.8187	71.6353	71.4445	
alpha	5.7361	5.7430	5.7498	5.7819	5.7879	5.8163	5.8163	5.8216	5.8053	5.7879	5.7757	5.7630	
util living area	0.9977	0.9937	0.9827	0.9394	0.8288	0.6352	0.4662	0.5161	0.7728	0.9623	0.9942	0.9983	(86)
MIT	19.8723	20.0553	20.3110	20.6384	20.8750	20.9786	20.9969	20.9946	20.9369	20.6178	20.1825	19.8385	(87)
Th 2	19.9207	19.9221	19.9235	19.9299	19.9311	19.9367	19.9367	19.9378	19.9346	19.9311	19.9287	19.9261	(88)
util rest of house	0.9968	0.9912	0.9755	0.9149	0.7686	0.5393	0.3553	0.4001	0.6823	0.9416	0.9914	0.9975	(89)
MIT 2	18.9092	19.0919	19.3443	19.6587	19.8573	19.9289	19.9362	19.9367	19.9064	19.6477	19.2244	18.8798	(90)
Living area fraction									fLA = Living area / (4) =			0.4931	(91)
MIT	19.3841	19.5670	19.8210	20.1418	20.3592	20.4465	20.4593	20.4584	20.4146	20.1261	19.6968	19.3526	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3841	19.5670	19.8210	20.1418	20.3592	20.4465	20.4593	20.4584	20.4146	20.1261	19.6968	19.3526	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9961	0.9901	0.9747	0.9204	0.7944	0.5864	0.4102	0.4576	0.7256	0.9461	0.9906	0.9970	(94)
Useful gains	388.1248	453.3579	497.1399	524.7427	477.6662	348.5942	234.2446	245.4294	361.6661	411.7217	385.0462	369.9200	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	934.2157	907.0575	822.6437	689.5824	530.4898	356.0686	235.0383	246.8935	385.4520	583.6008	773.7021	933.1601	(97)
Space heating kWh	406.2917	304.8861	242.1749	118.6846	39.3008	0.0000	0.0000	0.0000	0.0000	127.8780	279.8322	419.0506	(98a)
Space heating requirement - total per year (kWh/year)												1938.0989	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	406.2917	304.8861	242.1749	118.6846	39.3008	0.0000	0.0000	0.0000	0.0000	127.8780	279.8322	419.0506	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1938.0989	
Space heating per m2										(98c) / (4) =		37.5237	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	572.4840	450.6789	462.3515	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9101	0.9580	0.9403	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	521.0101	431.7654	434.7635	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	667.2663	641.4060	602.2981	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	105.3044	155.9726	124.6457	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.3261	38.9931	31.1614	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												96.4807	(107)
Energy for space heating												37.5237	(99)
Energy for space cooling												1.8680	(108)
Total												39.3917	(109)
Fabric Energy Efficiency (DFEE)												39.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.7075	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1519	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4019	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3416	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4355	0.4270	0.4184	0.3757	0.3672	0.3245	0.3245	0.3160	0.3416	0.3672	0.3843	0.4013	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5948	0.5912	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8600	1.1450	12.4351			(27)
Exposed Floor			51.6500	0.1300	6.7145			(28b)
Brickwork	41.4600	10.8600	30.6000	0.1800	5.5080			(29a)
Communal Wall	6.8200	2.0600	4.7600	0.1800	0.8568			(29a)
Total net area of external elements Aum(A, m2)			99.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.5744			(33)
Main dwelling								
Party Wall 1			34.6600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	306.6699	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.7600	0.0700	1.1732
E18 Party wall between dwellings	5.7600	0.0600	0.3456
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.0200	0.0540
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0500	0.9245
E20 Exposed floor (normal)	14.0600	0.3200	4.4992
P8 Party Wall - Exposed floor (inverted)	5.2000	0.2400	1.2480
E16 Corner (normal)	2.8800	0.0900	0.2592
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
P7 Party Wall - Exposed floor (normal)	6.8300	0.1600	1.0928

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.7903	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	37.3647	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.8535	25.6935	25.5366	24.7997	24.6618	24.0200	24.0200	23.9012	24.2672	24.6618	24.9407	25.2323	(38)
Heat transfer coeff	63.2182	63.0582	62.9013	62.1644	62.0265	61.3847	61.3847	61.2659	61.6320	62.0265	62.3054	62.5970	(39)
Average = Sum(39)m / 12 =												62.1637	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2240	1.2209	1.2178	1.2036	1.2009	1.1885	1.1885	1.1862	1.1933	1.2009	1.2063	1.2119	(40)
HLP (average)												1.2036	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7387	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)
Hot water usage for other uses	32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)
Average daily hot water use (litres/day)												50.8820	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5117	53.9894	52.3273	50.2580	48.4122	46.4939	46.0949	47.7536	49.4549	51.4249	53.5126	55.4336	(44)
Energy conte	87.9169	76.8803	80.4252	68.8007	65.1722	57.1697	55.7477	59.1289	60.9828	69.7831	76.2385	86.7957	(45)
Energy content (annual)										Total = Sum(45)m =		845.0417	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(64)
									Total per year (kWh/year) = Sum(64)m =			718.2855	(64)
12Total per year (kWh/year)												718	(64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	42.7425	38.0839	41.5862	39.6852	40.4299	38.5662	39.8517	40.4299	39.6852	41.5862	40.8042	42.7425	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 486.1935 (64a)

Heat gains from water heating, kWh/month

	29.3680	25.8580	27.4869	24.5415	23.9566	21.7901	21.8093	22.6724	22.8801	25.2255	26.4017	29.1297 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498 (71)

Water heating gains (Table 5)

	39.4731	38.4792	36.9448	34.0854	32.1997	30.2640	29.3136	30.4736	31.7780	33.9052	36.6691	39.1528 (72)

Total internal gains

	316.6985	325.4869	311.7804	303.0404	287.9530	278.5645	268.3745	267.9622	275.7829	283.7907	299.7563	309.6929 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.7200	46.7521	0.6300	0.7000	0.7700	38.8635	(78)
West	8.1400	19.6403	0.6300	0.7000	0.7700	48.8589	(80)

Solar gains	87.7223	159.2267	238.4806	321.1985	376.8282	379.8959	363.9756	322.7195	267.7615	182.0625	106.9877	73.7608	(83)
Total gains	404.4209	484.7136	550.2610	624.2389	664.7812	658.4604	632.3500	590.6817	543.5443	465.8532	406.7440	383.4537	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.5980	69.7746	69.9487	70.7778	70.9351	71.6768	71.6768	71.8158	71.3893	70.9351	70.6176	70.2887	
alpha	5.6399	5.6516	5.6632	5.7185	5.7290	5.7785	5.7785	5.7877	5.7593	5.7290	5.7078	5.6859	
util living area	0.9972	0.9919	0.9765	0.9180	0.7849	0.5841	0.4253	0.4736	0.7312	0.9515	0.9929	0.9979	(86)
MIT	19.8646	20.0696	20.3473	20.6873	20.9039	20.9855	20.9980	20.9964	20.9514	20.6476	20.1935	19.8337	(87)
Th 2	19.9009	19.9033	19.9058	19.9171	19.9193	19.9292	19.9292	19.9311	19.9254	19.9193	19.9150	19.9105	(88)
util rest of house	0.9961	0.9887	0.9671	0.8876	0.7199	0.4924	0.3229	0.3656	0.6386	0.9264	0.9894	0.9971	(89)
MIT 2	18.8856	19.0906	19.3639	19.6888	19.8648	19.9241	19.9289	19.9304	19.9046	19.6635	19.2240	18.8625	(90)
Living area fraction									fLA = Living area / (4) =			0.4931	(91)
MIT	19.3684	19.5733	19.8488	20.1812	20.3772	20.4475	20.4561	20.4561	20.4208	20.1488	19.7021	19.3415	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3684	19.5733	19.8488	20.1812	20.3772	20.4475	20.4561	20.4561	20.4208	20.1488	19.7021	19.3415	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9875	0.9665	0.8959	0.7490	0.5376	0.3735	0.4191	0.6834	0.9327	0.9886	0.9965	(94)
Useful gains	402.5594	478.6567	531.8379	559.2575	497.9332	353.9668	236.1982	247.5364	371.4494	434.4920	402.0966	382.1203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	952.5985	925.2743	839.6598	701.2889	538.2165	358.9497	236.7054	248.4982	389.5620	592.2770	785.1790	947.8112	(97)
Space heating kWh	409.2291	300.1270	229.0195	102.2626	29.9707	0.0000	0.0000	0.0000	0.0000	117.3921	275.8193	420.8740	(98a)
Space heating requirement - total per year (kWh/year)												1884.6944	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	409.2291	300.1270	229.0195	102.2626	29.9707	0.0000	0.0000	0.0000	0.0000	117.3921	275.8193	420.8740	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1884.6944	
Space heating per m2											(98c) / (4) =	36.4897	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	577.0166	454.2471	465.6208	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9365	0.9719	0.9584	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	540.3692	441.4733	446.2508	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	742.1110	713.1142	665.8783	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	145.2541	202.1009	163.4029	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.3135	50.5252	40.8507	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												127.6895	(107)
Energy for space heating												36.4897	(99)
Energy for space cooling												2.4722	(108)

Total	38.9619 (109)
Fabric Energy Efficiency (TFEE)	39.0 (109)

Full SAP Calculation Printout

Plot Reference	P-25	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-25
Plot Address	Flat 5, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	5.61	**TER**	15.51
Environmental	96 A	**% DER < TER**			63.83
CO_2 Emissions (t/year)	0.23	**DFEE**	39.39	**TFEE**	38.96
Compliance Check	See BREL	**% DFEE < TFEE**			-1.10
% DPER < TPER	29.85	**DPER**	57.98	**TPER**	82.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	131.7075	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9900	(17)
Infiltration rate		0.1495	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1271	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1620	0.1588	0.1557	0.1398	0.1366	0.1207	0.1207	0.1175	0.1271	0.1366	0.1430	0.1493	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000	(23c)
Effective ac	0.2980	0.2948	0.2917	0.2758	0.2726	0.2567	0.2567	0.2535	0.2631	0.2726	0.2790	0.2853	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Exposed Floor			51.6500	0.1275	6.5856	110.0000	5681.5000	(28b)
Brickwork	41.4600	10.8600	30.6000	0.2100	6.4260	110.0000	3365.9999	(29a)
Communal Wall	6.8200	2.0600	4.7600	0.2200	1.0472	110.0000	523.6000	(29a)
Total net area of external elements Aum(A, m2)			99.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.9659			(33)
Main dwelling								
Party Wall 1			34.6600	0.0000	0.0000	110.0000	3812.6000	(32)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			100.7000			9.0000	906.3000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15839.4999	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							306.6699	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.7600	0.0380	0.6369
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	14.0600	0.1200	1.6872
P8 Party Wall - Exposed floor (inverted)	5.2000	0.3200	1.6640
E16 Corner (normal)	2.8800	0.0540	0.1555
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
P7 Party Wall - Exposed floor (normal)	6.8300	0.4800	3.2784

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9181 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.8840 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9530	12.8149	12.6769	11.9865	11.8484	11.1580	11.1580	11.0199	11.4342	11.8484	12.1245	12.4007	(38)
Heat transfer coeff	50.8370	50.6989	50.5608	49.8704	49.7324	49.0420	49.0420	48.9039	49.3181	49.7324	50.0085	50.2847	(39)

Average = Sum(39)m / 12 = 49.8359

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9843	0.9816	0.9789	0.9655	0.9629	0.9495	0.9495	0.9468	0.9549	0.9629	0.9682	0.9736	(40)
HLP (average)												0.9649	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)
Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)

Energy content (annual) Total = Sum(45)m = 1662.4694

Distribution loss (46)m = 0.15 x (45)m												
25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)

Total per year (kWh/year) = Sum(64)m = 2007.3944 (64)
12Total per year (kWh/year) 2007 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains	354.2931	362.0874	346.0852	331.8094	313.4656	300.6378	288.0966	289.2516	298.9655	310.8102	332.0596	346.5342	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)

South			2.7200		46.7521		0.3300		0.0000		0.7700		32.3128 (78)
West			2.7200		19.6403		0.3300		0.0000		0.7700		13.5744 (80)
Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	427.2292	494.4754	544.3684	598.8678	626.7770	616.4998	590.7218	557.5747	521.5941	462.1848	421.0139	407.8622	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.5484	86.7841	87.0211	88.2258	88.4708	89.7162	89.7162	89.9695	89.2139	88.4708	87.9822	87.4990	
alpha	6.7699	6.7856	6.8014	6.8817	6.8981	6.9811	6.9811	6.9980	6.9476	6.8981	6.8655	6.8333	
util living area	0.9952	0.9866	0.9623	0.8764	0.7118	0.5069	0.3651	0.4030	0.6403	0.9168	0.9871	0.9964	(86)
MIT	20.2345	20.4065	20.6217	20.8576	20.9703	20.9975	20.9998	20.9996	20.9886	20.8306	20.4938	20.2068	(87)
Th 2	20.0965	20.0987	20.1009	20.1121	20.1144	20.1256	20.1256	20.1279	20.1211	20.1144	20.1099	20.1054	(88)
util rest of house	0.9934	0.9818	0.9493	0.8412	0.6534	0.4388	0.2927	0.3269	0.5644	0.8834	0.9816	0.9951	(89)
MIT 2	19.2189	19.4376	19.7045	19.9835	20.0936	20.1245	20.1256	20.1278	20.1151	19.9635	19.5584	19.1908	(90)
Living area fraction									fLA = Living area / (4) =			0.4931	(91)
MIT	19.7197	19.9154	20.1568	20.4145	20.5259	20.5550	20.5567	20.5577	20.5458	20.3911	20.0197	19.6918	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7197	19.9154	20.1568	20.4145	20.5259	20.5550	20.5567	20.5577	20.5458	20.3911	20.0197	19.6918	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9925	0.9806	0.9502	0.8541	0.6812	0.4724	0.3284	0.3645	0.6017	0.8950	0.9809	0.9942	(94)
Useful gains	424.0078	484.8686	517.2679	511.4650	426.9469	291.2073	193.9878	203.2155	313.8374	413.6400	412.9864	405.5129	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	783.8921	761.2656	690.4970	574.2352	438.9343	292.0439	194.0427	203.3265	317.8967	486.9338	646.0944	779.0002	(97)
Space heating kWh	267.7539	185.7388	128.8825	45.1946	8.9186	0.0000	0.0000	0.0000	0.0000	54.5306	167.8378	277.8746	(98a)
Space heating requirement - total per year (kWh/year)												1136.7314	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.7539	185.7388	128.8825	45.1946	8.9186	0.0000	0.0000	0.0000	0.0000	54.5306	167.8378	277.8746	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1136.7314	
Space heating per m2											(98c) / (4) =	22.0084	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	267.7539	185.7388	128.8825	45.1946	8.9186	0.0000	0.0000	0.0000	0.0000	54.5306	167.8378	277.8746	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	267.7539	185.7388	128.8825	45.1946	8.9186	0.0000	0.0000	0.0000	0.0000	54.5306	167.8378	277.8746	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1136.7314	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.4014	(230a)
Total electricity for the above, kWh/year	94.4014	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1922.4124	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1136.7314	0.1573	178.7744	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			257.0830	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			289.8408	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1136.7314	1.5822	1798.5372	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)
Space and water heating			2643.1414	(279)
Pumps, fans and electric keep-hot	94.4014	1.5128	142.8104	(281)
Energy for lighting	136.2372	1.5338	208.9651	(282)
Total Primary energy kWh/year			2994.9169	(286)
Dwelling Primary energy Rate (DPER)			57.9800	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b) x	2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.7075	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1519	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4019	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3416	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4355	0.4270	0.4184	0.3757	0.3672	0.3245	0.3245	0.3160	0.3416	0.3672	0.3843	0.4013	(22b)
Effective ac	0.5948	0.5912	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8600	1.1450	12.4351			(27)
Exposed Floor			51.6500	0.1300	6.7145			(28b)
Brickwork	41.4600	10.8600	30.6000	0.1800	5.5080			(29a)
Communal Wall	6.8200	2.0600	4.7600	0.1800	0.8568			(29a)
Total net area of external elements Aum(A, m2)			99.9300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.5744			(33)
Main dwelling								
Party Wall 1			34.6600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 306.6699 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	16.7600	0.0700	1.1732	
E18 Party wall between dwellings	5.7600	0.0600	0.3456	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.0200	0.0540	
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775	
E4 Jamb	18.4900	0.0500	0.9245	
E20 Exposed floor (normal)	14.0600	0.3200	4.4992	
P8 Party Wall - Exposed floor (inverted)	5.2000	0.2400	1.2480	
E16 Corner (normal)	2.8800	0.0900	0.2592	
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565	
P7 Party Wall - Exposed floor (normal)	6.8300	0.1600	1.0928	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7903 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 37.3647 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.8535	25.6935	25.5366	24.7997	24.6618	24.0200	24.0200	23.9012	24.2672	24.6618	24.9407	25.2323	(38)
Heat transfer coeff	63.2182	63.0582	62.9013	62.1644	62.0265	61.3847	61.3847	61.2659	61.6320	62.0265	62.3054	62.5970	(39)
Average = Sum(39)m / 12 =												62.1637	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2240	1.2209	1.2178	1.2036	1.2009	1.1885	1.1885	1.1862	1.1933	1.2009	1.2063	1.2119	(40)
HLP (average)												1.2036	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m													
	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	219.0409	193.8256	206.0225	181.1975	175.7315	158.4238	156.3170	162.4195	164.1044	182.9195	194.4456	216.6389	(62)
WWHRS	-24.3997	-21.5793	-22.5966	-18.7109	-17.4379	-14.9217	-13.9867	-14.8735	-15.4386	-18.2004	-20.6188	-23.9478	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
										Total per year (kWh/year) = Sum(64)m =		1984.3750	(64)
12Total per year (kWh/year)												1984	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	94.6142	84.1221	90.2856	81.3286	80.2138	73.7564	73.7585	75.7876	75.6451	82.6039	85.7336	93.8156	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	127.1696	125.1817	121.3516	112.9564	107.8143	102.4394	99.1378	101.8651	105.0627	111.0267	119.0744	126.0962	(72)
Total internal gains													
	407.3951	415.1894	399.1873	384.9114	366.5676	350.7398	338.1986	339.3536	349.0676	363.9122	385.1616	399.6363	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.7200	46.7521	0.6300	0.7000	0.7700	38.8635	(78)
West	8.1400	19.6403	0.6300	0.7000	0.7700	48.8589	(80)

Solar gains	87.7223	159.2267	238.4806	321.1985	376.8282	379.8959	363.9756	322.7195	267.7615	182.0625	106.9877	73.7608	(83)
Total gains	495.1174	574.4161	637.6679	706.1099	743.3958	730.6357	702.1742	662.0732	616.8290	545.9747	492.1494	473.3971	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.5980	69.7746	69.9487	70.7778	70.9351	71.6768	71.6768	71.8158	71.3893	70.9351	70.6176	70.2887	
alpha	5.6399	5.6516	5.6632	5.7185	5.7290	5.7785	5.7785	5.7877	5.7593	5.7290	5.7078	5.6859	
util living area													
	0.9925	0.9822	0.9563	0.8767	0.7263	0.5307	0.3837	0.4239	0.6621	0.9124	0.9825	0.9941	(86)
MIT	20.0180	20.2148	20.4736	20.7676	20.9355	20.9911	20.9988	20.9980	20.9705	20.7434	20.3325	19.9871	(87)
Th 2	19.9009	19.9033	19.9058	19.9171	19.9193	19.9292	19.9292	19.9311	19.9254	19.9193	19.9150	19.9105	(88)
util rest of house													
	0.9897	0.9757	0.9407	0.8379	0.6588	0.4453	0.2909	0.3264	0.5710	0.8746	0.9748	0.9918	(89)
MIT 2	18.7928	19.0419	19.3618	19.7083	19.8744	19.9253	19.9290	19.9306	19.9101	19.6939	19.2014	18.7608	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.3969	19.6202	19.9100	20.2306	20.3977	20.4509	20.4565	20.4569	20.4330	20.2115	19.7592	19.3655	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3969	19.6202	19.9100	20.2306	20.3977	20.4509	20.4565	20.4569	20.4330	20.2115	19.7592	19.3655	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9880	0.9736	0.9408	0.8501	0.6898	0.4874	0.3367	0.3746	0.6153	0.8861	0.9734	0.9903	(94)
Useful gains	489.1586	559.2598	599.8979	600.2646	512.8260	356.1134	236.4399	248.0161	379.5544	483.7972	479.0603	468.8123	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	954.4022	928.2317	843.5078	704.3618	539.4856	359.1534	236.7333	248.5518	390.3153	596.1662	788.7361	949.3156	(97)
Space heating kWh													
	346.1412	247.9491	181.2458	74.9500	19.8347	0.0000	0.0000	0.0000	0.0000	83.6025	222.9666	357.4944	(98a)
Space heating requirement - total per year (kWh/year)												1534.1844	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	346.1412	247.9491	181.2458	74.9500	19.8347	0.0000	0.0000	0.0000	0.0000	83.6025	222.9666	357.4944	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1534.1844	
Space heating per m2											(98c) / (4) =	29.7035	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	346.1412	247.9491	181.2458	74.9500	19.8347	0.0000	0.0000	0.0000	0.0000	83.6025	222.9666	357.4944	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	375.0176	268.6339	196.3659	81.2026	21.4894	0.0000	0.0000	0.0000	0.0000	90.5770	241.5672	387.3179	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3360	84.8761	84.0330	82.4374	80.7109	79.8000	79.8000	79.8000	79.8000	82.6191	84.6192	85.4257	(217)
Fuel for water heating, kWh/month													
	228.0881	202.9386	218.2785	197.1030	196.1243	179.8273	178.3588	184.8948	186.2980	199.3717	205.4224	225.5656	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9214	12.7728	11.5005	8.4257	6.5083	5.3173	5.9371	7.7172	10.0239	13.1519	14.8551	16.3640	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.9766	-20.7826	-31.4959	-37.4135	-42.1278	-39.9999	-39.5329	-36.4411	-31.2895	-24.6504	-15.7505	-11.9625	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.9299	-10.6083	-21.5278	-32.9858	-44.2484	-44.6716	-44.1257	-37.0541	-26.7727	-15.3613	-6.6443	-3.8795 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1662.1716	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2402.2712	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.4952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-638.2327	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3640.7053	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1662.1716	0.2100	349.0560	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2402.2712	0.2100	504.4770	(264)
Space and water heating			853.5330	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.4952	0.1443	18.5458	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	0.1335	-46.1008	
PV Unit electricity exported	-292.8094	0.1253	-36.6969	
Total			-82.7977	(269)
Total CO2, kg/year			801.2104	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1662.1716	1.1300	1878.2539	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2402.2712	1.1300	2714.5665	(278)
Space and water heating			4592.8204	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.4952	1.5338	197.0902	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	1.4932	-515.7819	
PV Unit electricity exported	-292.8094	0.4600	-134.6951	
Total			-650.4770	(283)
Total Primary energy kWh/year			4269.5344	(286)
Target Primary Energy Rate (TPER)			82.6600	(287)

Full SAP Calculation Printout

Plot Reference	P-25	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-25
Plot Address	Flat 5, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	5.61	**TER**	15.51
Environmental	96 A	**% DER < TER**			63.83
CO_2 Emissions (t/year)	0.23	**DFEE**	39.39	**TFEE**	38.96
Compliance Check	See BREL	**% DFEE < TFEE**			-1.10
% DPER < TPER	29.85	**DPER**	57.98	**TPER**	82.66

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500 (1b)	x	2.5500 (2b)	=	131.7075	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.7075	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9900	(17)
Infiltration rate		0.1495	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1271	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1620	0.1588	0.1557	0.1398	0.1366	0.1207	0.1207	0.1175	0.1271	0.1366	0.1430	0.1493	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000	(23c)
Effective ac	0.2980	0.2948	0.2917	0.2758	0.2726	0.2567	0.2567	0.2535	0.2631	0.2726	0.2790	0.2853	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Exposed Floor			51.6500	0.1275	6.5856	110.0000	5681.5000	(28b)
Brickwork	41.4600	10.8600	30.6000	0.2100	6.4260	110.0000	3365.9999	(29a)
Communal Wall	6.8200	2.0600	4.7600	0.2200	1.0472	110.0000	523.6000	(29a)
Total net area of external elements Aum(A, m2)			99.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.9659			(33)
Main dwelling								
Party Wall 1			34.6600	0.0000	0.0000	110.0000	3812.6000	(32)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			100.7000			9.0000	906.3000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15839.4999	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							306.6699	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	16.7600	0.0380	0.6369
E18	Party wall between dwellings	5.7600	0.0380	0.2189
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E2	Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4	Jamb	18.4900	0.0160	0.2958
E20	Exposed floor (normal)	14.0600	0.1200	1.6872
P8	Party Wall - Exposed floor (inverted)	5.2000	0.3200	1.6640
E16	Corner (normal)	2.8800	0.0540	0.1555
E25	Staggered party wall between dwellings	2.8800	0.0310	0.0893
E17	Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
P7	Party Wall - Exposed floor (normal)	6.8300	0.4800	3.2784

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9181 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.8840 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9530	12.8149	12.6769	11.9865	11.8484	11.1580	11.1580	11.0199	11.4342	11.8484	12.1245	12.4007	(38)
Heat transfer coeff	50.8370	50.6989	50.5608	49.8704	49.7324	49.0420	49.0420	48.9039	49.3181	49.7324	50.0085	50.2847	(39)

Average = Sum(39)m / 12 = 49.8359

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9843	0.9816	0.9789	0.9655	0.9629	0.9495	0.9495	0.9468	0.9549	0.9629	0.9682	0.9736	(40)
HLP (average)												0.9649	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)
Hot water usage for baths	23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)
Hot water usage for other uses	32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)

Energy content (annual) Total = Sum(45)m = 1662.4694

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss (46)m = 0.15 x (45)m	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)

Total per year (kWh/year) = Sum(64)m = 2007.3944 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts (66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)

West				2.7200		19.6403		0.3300		0.0000		0.7700	13.5744 (80)
Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279 (83)	
Total gains	477.3818	535.0361	587.9888	632.3953	654.9515	635.9633	609.9827	578.2176	544.8330	495.5167	459.6987	455.2580 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.5484	86.7841	87.0211	88.2258	88.4708	89.7162	89.7162	89.9695	89.2139	88.4708	87.9822	87.4990	
alpha	6.7699	6.7856	6.8014	6.8817	6.8981	6.9811	6.9811	6.9980	6.9476	6.8981	6.8655	6.8333	
util living area													
	0.9910	0.9796	0.9462	0.8517	0.6861	0.4917	0.3536	0.3887	0.6155	0.8913	0.9794	0.9932 (86)	
MIT	20.3210	20.4721	20.6805	20.8826	20.9761	20.9979	20.9998	20.9997	20.9910	20.8630	20.5565	20.2896 (87)	
Th 2	20.0965	20.0987	20.1009	20.1121	20.1144	20.1256	20.1256	20.1279	20.1211	20.1144	20.1099	20.1054 (88)	
util rest of house													
	0.9878	0.9727	0.9292	0.8135	0.6281	0.4255	0.2834	0.3152	0.5413	0.8524	0.9711	0.9907 (89)	
MIT 2	19.3281	19.5187	19.7731	20.0082	20.0979	20.1247	20.1256	20.1278	20.1164	19.9962	19.6354	19.2957 (90)	
Living area fraction										fLA = Living area / (4) =		0.4931 (91)	
MIT	19.8178	19.9889	20.2205	20.4394	20.5310	20.5553	20.5567	20.5577	20.5477	20.4237	20.0896	19.7858 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.8178	19.9889	20.2205	20.4394	20.5310	20.5553	20.5567	20.5577	20.5477	20.4237	20.0896	19.7858 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9866	0.9717	0.9317	0.8284	0.6559	0.4582	0.3180	0.3515	0.5778	0.8671	0.9709	0.9896 (94)	
Useful gains	470.9645	519.8843	547.8321	523.8732	429.5898	291.3675	193.9994	203.2414	314.8027	429.6733	446.3027	450.5289 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
	788.8765	764.9887	693.7209	575.4754	439.1857	292.0593	194.0440	203.3292	317.9885	488.5540	649.5922	783.7275 (97)	
Space heating kWh													
	236.5265	164.7102	108.5413	37.1536	7.1394	0.0000	0.0000	0.0000	0.0000	43.8073	146.3685	247.8998 (98a)	
Space heating requirement - total per year (kWh/year)												992.1465	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	236.5265	164.7102	108.5413	37.1536	7.1394	0.0000	0.0000	0.0000	0.0000	43.8073	146.3685	247.8998 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												992.1465	
Space heating per m2											(98c) / (4) =	19.2090 (99)	

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	236.5265	164.7102	108.5413	37.1536	7.1394	0.0000	0.0000	0.0000	0.0000	43.8073	146.3685	247.8998 (98)	
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)													
	236.5265	164.7102	108.5413	37.1536	7.1394	0.0000	0.0000	0.0000	0.0000	43.8073	146.3685	247.8998 (211)	
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390 (64)	
Efficiency of water heater												361.6650 (216)	
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)	
Fuel for water heating, kWh/month													
	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176 (231)	
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												992.1465 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	

Efficiency of water heater	361.6650	
Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.4014	(230a)
Total electricity for the above, kWh/year	94.4014	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1777.8275	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	992.1465	16.4900	163.6050	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	16.4900	91.5265	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.4014	16.4900	15.5668	(249)
Energy for lighting	136.2372	16.4900	22.4655	(250)
Additional standing charges			0.0000	(251)
Total energy cost			293.1638	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0920	(257)
SAP value		82.2992	
SAP rating (Section 12)		82	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	992.1465	0.1575	156.2367	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			234.5453	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			267.3031	(272)
CO2 emissions per m2			5.1800	(273)
EI value			96.2940	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b) x	2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.6500						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.7075	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.9900	(17)
Infiltration rate	0.1495	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1271	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1366	0.1303	0.1303	0.1207	0.1239	0.1080	0.1080	0.1048	0.1080	0.1207	0.1175	0.1271	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2726	0.2663	0.2663	0.2567	0.2599	0.2440	0.2440	0.2408	0.2440	0.2567	0.2535	0.2631	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Exposed Floor			51.6500	0.1275	6.5856	110.0000	5681.5000	(28b)
Brickwork	41.4600	10.8600	30.6000	0.2100	6.4260	110.0000	3365.9999	(29a)
Communal Wall	6.8200	2.0600	4.7600	0.2200	1.0472	110.0000	523.6000	(29a)
Total net area of external elements Aum(A, m2)			99.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.9659			(33)
Main dwelling								
Party Wall 1			34.6600	0.0000	0.0000	110.0000	3812.6000	(32)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			100.7000			9.0000	906.3000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	15839.4999	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	306.6699	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.7600	0.0380	0.6369
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	14.0600	0.1200	1.6872
P8 Party Wall - Exposed floor (inverted)	5.2000	0.3200	1.6640
E16 Corner (normal)	2.8800	0.0540	0.1555
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
P7 Party Wall - Exposed floor (normal)	6.8300	0.4800	3.2784

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.9181	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	37.8840	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.8484	11.5722	11.5722	11.1580	11.2961	10.6057	10.6057	10.4676	10.6057	11.1580	11.0199	11.4342	(38)
Heat transfer coeff	49.7324	49.4562	49.4562	49.0420	49.1801	48.4897	48.4897	48.3516	48.4897	49.0420	48.9039	49.3181	(39)
Average = Sum(39)m / 12 =												48.9959	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9629	0.9575	0.9575	0.9495	0.9522	0.9388	0.9388	0.9361	0.9388	0.9495	0.9468	0.9549	(40)
HLP (average)												0.9486	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7387	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)
Hot water usage for baths	23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)
Hot water usage for other uses	32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)
Average daily hot water use (litres/day)												100.0897	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
									Total per year (kWh/year) = Sum(64)m =			2007.3944	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
South	2.7200	54.2217	0.3300	0.0000	0.7700	37.4754	(78)
West	2.7200	23.8018	0.3300	0.0000	0.7700	16.4506	(80)

Solar gains	86.7064	137.5977	204.8017	280.5280	321.2121	342.8499	325.1121	295.1017	245.2762	168.9195	104.1885	73.3186	(83)
Total gains	491.1520	540.2458	594.5073	645.8648	662.8522	662.9512	632.4697	604.9961	567.4807	513.0615	474.9329	467.2486	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	88.4708	88.9648	88.9648	89.7162	89.4643	90.7381	90.7381	90.9973	90.7381	89.7162	89.9695	89.2139	
alpha	6.8981	6.9310	6.9310	6.9811	6.9643	7.0492	7.0492	7.0665	7.0492	6.9811	6.9980	6.9476	
util living area	0.9855	0.9703	0.9209	0.7889	0.5939	0.3801	0.2530	0.2717	0.5104	0.8288	0.9636	0.9887	(86)
MIT	20.4441	20.5782	20.7731	20.9367	20.9915	20.9997	21.0000	21.0000	20.9977	20.9261	20.6764	20.4153	(87)
Th 2	20.1144	20.1189	20.1189	20.1256	20.1234	20.1346	20.1346	20.1369	20.1346	20.1256	20.1279	20.1211	(88)
util rest of house	0.9803	0.9602	0.8972	0.7422	0.5327	0.3170	0.1867	0.2027	0.4380	0.7766	0.9494	0.9846	(89)
MIT 2	19.4975	19.6665	19.8962	20.0741	20.1184	20.1345	20.1346	20.1369	20.1337	20.0684	19.7963	19.4673	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.9643	20.1161	20.3286	20.4995	20.5489	20.5612	20.5614	20.5625	20.5597	20.4913	20.2303	19.9348	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9643	20.1161	20.3286	20.4995	20.5489	20.5612	20.5614	20.5625	20.5597	20.4913	20.2303	19.9348	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9602	0.9034	0.7629	0.5627	0.3481	0.2194	0.2368	0.4737	0.7996	0.9513	0.9835	(94)
Useful gains	480.9260	518.7261	537.0498	492.7499	372.9928	230.7785	138.7440	143.2375	268.8421	410.2611	451.7960	459.5398	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	739.2359	712.9654	639.4002	519.8202	376.1753	230.8672	138.7465	143.2416	269.5890	440.9527	598.1078	731.6250	(97)
Space heating kWh	192.1826	130.5288	76.1487	19.4906	2.3677	0.0000	0.0000	0.0000	0.0000	22.8346	105.3445	202.4314	(98a)
Space heating requirement - total per year (kWh/year)												751.3289	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	192.1826	130.5288	76.1487	19.4906	2.3677	0.0000	0.0000	0.0000	0.0000	22.8346	105.3445	202.4314	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												751.3289	
Space heating per m2											(98c) / (4) =	14.5465	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Space heating requirement												
	192.1826	130.5288	76.1487	19.4906	2.3677	0.0000	0.0000	0.0000	0.0000	22.8346	105.3445	202.4314 (98)
Space heating efficiency (main heating system 1)												
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)												
	192.1826	130.5288	76.1487	19.4906	2.3677	0.0000	0.0000	0.0000	0.0000	22.8346	105.3445	202.4314 (211)
Space heating efficiency (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement												
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390 (64)
Efficiency of water heater												361.6650 (216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)
Fuel for water heating, kWh/month												
	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176 (231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												751.3289 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												361.6650
Water heating fuel used												555.0425 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)												
mechanical ventilation fans (SFP = 0.5875)												94.4014 (230a)
Total electricity for the above, kWh/year												94.4014 (231)
Electricity for lighting (calculated in Appendix L)												136.2372 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												1537.0099 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	751.3289	27.6700	207.8927	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	27.6700	153.5803	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.4014	27.6700	26.1209	(249)
Energy for lighting	136.2372	27.6700	37.6968	(250)
Additional standing charges			0.0000	(251)
Total energy cost			425.2906	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	751.3289	0.1583	118.9697	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			197.2782	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			230.0361	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	751.3289	1.5862	1191.7214	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)
Space and water heating			2036.3256	(279)
Pumps, fans and electric keep-hot	94.4014	1.5128	142.8104	(281)

Energy for lighting	136.2372	1.5338	208.9651 (282)
Total Primary energy kWh/year			2388.1011 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 82
Current environmental impact rating: A 96

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 82
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£425	£425	£0
Space heating	£234	£234	£0
Water heating	£154	£154	£0
Lighting	£38	£38	£0
Total cost of fuels	£425	£425	£0
Total cost of uses	£426	£426	£0
Delivered energy	30 kWh/m²	30 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	46 kWh/m²	46 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500 (1b)	x	2.5500 (2b)	=	131.7075 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.7075	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9900 (17)
Infiltration rate		0.1495 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1271 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1620	0.1588	0.1557	0.1398	0.1366	0.1207	0.1207	0.1175	0.1271	0.1366	0.1430	0.1493	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2980	0.2948	0.2917	0.2758	0.2726	0.2567	0.2567	0.2535	0.2631	0.2726	0.2790	0.2853	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Exposed Floor			51.6500	0.1275	6.5856	110.0000	5681.5000	(28b)
Brickwork	41.4600	10.8600	30.6000	0.2100	6.4260	110.0000	3365.9999	(29a)
Communal Wall	6.8200	2.0600	4.7600	0.2200	1.0472	110.0000	523.6000	(29a)
Total net area of external elements Aum(A, m2)			99.9300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9659			(33)
Main dwelling								
Party Wall 1			34.6600	0.0000	0.0000	110.0000	3812.6000	(32)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			100.7000			9.0000	906.3000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15839.4999 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 306.6699 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.7600	0.0380	0.6369
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	14.0600	0.1200	1.6872
P8 Party Wall - Exposed floor (inverted)	5.2000	0.3200	1.6640
E16 Corner (normal)	2.8800	0.0540	0.1555
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
P7 Party Wall - Exposed floor (normal)	6.8300	0.4800	3.2784

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9181 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.8840 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.9530	12.8149	12.6769	11.9865	11.8484	11.1580	11.1580	11.0199	11.4342	11.8484	12.1245	12.4007	(38)
Heat transfer coeff	50.8370	50.6989	50.5608	49.8704	49.7324	49.0420	49.0420	48.9039	49.3181	49.7324	50.0085	50.2847	(39)
Average = Sum(39)m / 12 =												49.8359	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9843	0.9816	0.9789	0.9655	0.9629	0.9495	0.9495	0.9468	0.9549	0.9629	0.9682	0.9736	(40)
HLP (average)												0.9649	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)
Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	

Distribution loss (46)m = 0.15 x (45)m

25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
									Total per year (kWh/year) = Sum(64)m =		2007.3944	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains													
	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
West	2.7200	19.6403	0.3300	0.0000	0.7700	13.5744	(80)

Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	477.3818	535.0361	587.9888	632.3953	654.9515	635.9633	609.9827	578.2176	544.8330	495.5167	459.6987	455.2580	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.5484	86.7841	87.0211	88.2258	88.4708	89.7162	89.7162	89.9695	89.2139	88.4708	87.9822	87.4990	
alpha	6.7699	6.7856	6.8014	6.8817	6.8981	6.9811	6.9811	6.9980	6.9476	6.8981	6.8655	6.8333	
util living area													
	0.9910	0.9796	0.9462	0.8517	0.6861	0.4917	0.3536	0.3887	0.6155	0.8913	0.9794	0.9932	(86)
MIT	20.3210	20.4721	20.6805	20.8826	20.9761	20.9979	20.9998	20.9997	20.9910	20.8630	20.5565	20.2896	(87)
Th 2	20.0965	20.0987	20.1009	20.1121	20.1144	20.1256	20.1256	20.1279	20.1211	20.1144	20.1099	20.1054	(88)
util rest of house													
	0.9878	0.9727	0.9292	0.8135	0.6281	0.4255	0.2834	0.3152	0.5413	0.8524	0.9711	0.9907	(89)
MIT 2	19.3281	19.5187	19.7731	20.0082	20.0979	20.1247	20.1256	20.1278	20.1164	19.9962	19.6354	19.2957	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.8178	19.9889	20.2205	20.4394	20.5310	20.5553	20.5567	20.5577	20.5477	20.4237	20.0896	19.7858	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8178	19.9889	20.2205	20.4394	20.5310	20.5553	20.5567	20.5577	20.5477	20.4237	20.0896	19.7858	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9866	0.9717	0.9317	0.8284	0.6559	0.4582	0.3180	0.3515	0.5778	0.8671	0.9709	0.9896	(94)
Useful gains	470.9645	519.8843	547.8321	523.8732	429.5898	291.3675	193.9994	203.2414	314.8027	429.6733	446.3027	450.5289	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	788.8765	764.9887	693.7209	575.4754	439.1857	292.0593	194.0440	203.3292	317.9885	488.5540	649.5922	783.7275	(97)
Space heating kWh													
	236.5265	164.7102	108.5413	37.1536	7.1394	0.0000	0.0000	0.0000	0.0000	43.8073	146.3685	247.8998	(98a)
Space heating requirement - total per year (kWh/year)												992.1465	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	236.5265	164.7102	108.5413	37.1536	7.1394	0.0000	0.0000	0.0000	0.0000	43.8073	146.3685	247.8998	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												992.1465	
Space heating per m2											(98c) / (4) =	19.2090	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	236.5265	164.7102	108.5413	37.1536	7.1394	0.0000	0.0000	0.0000	0.0000	43.8073	146.3685	247.8998	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	236.5265	164.7102	108.5413	37.1536	7.1394	0.0000	0.0000	0.0000	0.0000	43.8073	146.3685	247.8998	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating

Water heating requirement

	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390 (64)
Efficiency of water heater												361.6650 (216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)
Fuel for water heating, kWh/month												
	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176 (231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	992.1465	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.4014	(230a)
Total electricity for the above, kWh/year	94.4014	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1777.8275	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	992.1465	16.4900	163.6050	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	16.4900	91.5265	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.4014	16.4900	15.5668	(249)
Energy for lighting	136.2372	16.4900	22.4655	(250)
Additional standing charges			0.0000	(251)
Total energy cost			293.1638	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0920	(257)
SAP value		82.2992	
SAP rating (Section 12)		82	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	992.1465	0.1575	156.2367	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			234.5453	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			267.3031	(272)
CO2 emissions per m2			5.1800	(273)
EI value			96.2940	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500 (1b)	x	2.5500 (2b)	=	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.7075	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9900	(17)
Infiltration rate		0.1495	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1271	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1366	0.1303	0.1303	0.1207	0.1239	0.1080	0.1080	0.1048	0.1080	0.1207	0.1175	0.1271	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2726	0.2663	0.2663	0.2567	0.2599	0.2440	0.2440	0.2408	0.2440	0.2567	0.2535	0.2631	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Exposed Floor			51.6500	0.1275	6.5856	110.0000	5681.5000	(28b)
Brickwork	41.4600	10.8600	30.6000	0.2100	6.4260	110.0000	3365.9999	(29a)
Communal Wall	6.8200	2.0600	4.7600	0.2200	1.0472	110.0000	523.6000	(29a)
Total net area of external elements Aum(A, m2)			99.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.9659			(33)
Main dwelling								
Party Wall 1			34.6600	0.0000	0.0000	110.0000	3812.6000	(32)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			100.7000			9.0000	906.3000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15839.4999	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	306.6699	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.7600	0.0380	0.6369
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.0400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.7000	0.3300	0.8910
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	14.0600	0.1200	1.6872
P8 Party Wall - Exposed floor (inverted)	5.2000	0.3200	1.6640
E16 Corner (normal)	2.8800	0.0540	0.1555
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
P7 Party Wall - Exposed floor (normal)	6.8300	0.4800	3.2784

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.9181 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	37.8840 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.8484	11.5722	11.5722	11.1580	11.2961	10.6057	10.6057	10.4676	10.6057	11.1580	11.0199	11.4342	(38)
Heat transfer coeff	49.7324	49.4562	49.4562	49.0420	49.1801	48.4897	48.4897	48.3516	48.4897	49.0420	48.9039	49.3181	(39)
Average = Sum(39)m / 12 =												48.9959	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9629	0.9575	0.9575	0.9495	0.9522	0.9388	0.9388	0.9361	0.9388	0.9495	0.9468	0.9549	(40)
HLP (average)												0.9486	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7387 (42)
Hot water usage for mixer showers		

	53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)
Hot water usage for baths													
	23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)
Hot water usage for other uses													
	32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)
Average daily hot water use (litres/day)												100.0897	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m													
	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
										Total per year (kWh/year) = Sum(64)m =		2007.3944	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains													
	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
South	2.7200	54.2217	0.3300	0.0000	0.7700	37.4754	(78)
West	2.7200	23.8018	0.3300	0.0000	0.7700	16.4506	(80)

Solar gains	86.7064	137.5977	204.8017	280.5280	321.2121	342.8499	325.1121	295.1017	245.2762	168.9195	104.1885	73.3186	(83)
Total gains	491.1520	540.2458	594.5073	645.8648	662.8522	662.9512	632.4697	604.9961	567.4807	513.0615	474.9329	467.2486	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	88.4708	88.9648	88.9648	89.7162	89.4643	90.7381	90.7381	90.9973	90.7381	89.7162	89.9695	89.2139	
alpha	6.8981	6.9310	6.9310	6.9811	6.9643	7.0492	7.0492	7.0665	7.0492	6.9811	6.9980	6.9476	
util living area													
	0.9855	0.9703	0.9209	0.7889	0.5939	0.3801	0.2530	0.2717	0.5104	0.8288	0.9636	0.9887	(86)
MIT	20.4441	20.5782	20.7731	20.9367	20.9915	20.9997	21.0000	21.0000	20.9977	20.9261	20.6764	20.4153	(87)
Th 2	20.1144	20.1189	20.1189	20.1256	20.1234	20.1346	20.1346	20.1369	20.1346	20.1256	20.1279	20.1211	(88)
util rest of house													
	0.9803	0.9602	0.8972	0.7422	0.5327	0.3170	0.1867	0.2027	0.4380	0.7766	0.9494	0.9846	(89)
MIT 2	19.4975	19.6665	19.8962	20.0741	20.1184	20.1345	20.1346	20.1369	20.1337	20.0684	19.7963	19.4673	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.9643	20.1161	20.3286	20.4995	20.5489	20.5612	20.5614	20.5625	20.5597	20.4913	20.2303	19.9348	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9643	20.1161	20.3286	20.4995	20.5489	20.5612	20.5614	20.5625	20.5597	20.4913	20.2303	19.9348	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9602	0.9034	0.7629	0.5627	0.3481	0.2194	0.2368	0.4737	0.7996	0.9513	0.9835	(94)
Useful gains	480.9260	518.7261	537.0498	492.7499	372.9928	230.7785	138.7440	143.2375	268.8421	410.2611	451.7960	459.5398	(95)

Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	739.2359	712.9654	639.4002	519.8202	376.1753	230.8672	138.7465	143.2416	269.5890	440.9527	598.1078	731.6250	(97)
Space heating kWh	192.1826	130.5288	76.1487	19.4906	2.3677	0.0000	0.0000	0.0000	0.0000	22.8346	105.3445	202.4314	(98a)
Space heating requirement - total per year (kWh/year)												751.3289	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	192.1826	130.5288	76.1487	19.4906	2.3677	0.0000	0.0000	0.0000	0.0000	22.8346	105.3445	202.4314	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												751.3289	
Space heating per m2											(98c) / (4) =	14.5465	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	192.1826	130.5288	76.1487	19.4906	2.3677	0.0000	0.0000	0.0000	0.0000	22.8346	105.3445	202.4314	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	192.1826	130.5288	76.1487	19.4906	2.3677	0.0000	0.0000	0.0000	0.0000	22.8346	105.3445	202.4314	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												751.3289	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.0425	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												94.4014	(230a)
Total electricity for the above, kWh/year												94.4014	(231)
Electricity for lighting (calculated in Appendix L)												136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1537.0099	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	751.3289	27.6700	207.8927	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	27.6700	153.5803	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.4014	27.6700	26.1209	(249)
Energy for lighting	136.2372	27.6700	37.6968	(250)
Additional standing charges			0.0000	(251)
Total energy cost			425.2906	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	751.3289	0.1583	118.9697	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			197.2782	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			230.0361	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	751.3289	1.5862	1191.7214	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)
Space and water heating			2036.3256	(279)
Pumps, fans and electric keep-hot	94.4014	1.5128	142.8104	(281)
Energy for lighting	136.2372	1.5338	208.9651	(282)
Total Primary energy kWh/year			2388.1011	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-26	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-26
Plot Address	Flat 6, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.61	**TER**	12.68
Environmental	96 A	**% DER < TER**			63.64
CO_2 Emissions (t/year)	0.29	**DFEE**	35.21	**TFEE**	36.32
Compliance Check	See BREL	**% DFEE < TFEE**			3.06
% DPER < TPER	29.07	**DPER**	47.55	**TPER**	67.03

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	1.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	29.28 m	80.15 m²	2.55 m

8.0 Living Area	26.30	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	47.51	29.08	0.00	None	18.43	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	16.72	14.66	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	20.36	20.36	0.60	Stairwell Access Corridor 2	0.00	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.00	110.00	8.54	8.54	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	43.02	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	174.28

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Terrace Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	5.75	5.75 (m²)	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	74.40

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	80.15

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Window-Red	Brickwork	East	13.01	
East	Window-Red	Brickwork	East	5.42	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	47.28	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	6.36	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	27.06	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	8.10	0.33	0.33	Abbey Calculated	No
E16 Corner (normal)	Gov Approved Scheme	12.72	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	9.54	-0.10	-0.10	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	6.36	0.03	0.03	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	8.70	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.49	0.02	0.02	RCD	No
E15 Flat roof with parapet	Independently assessed	6.83	0.15	0.15	TBC	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value	0.00	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.70	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	12
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	0.00	
In Summer	0.00	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	0.00	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No

Summary for Input Data

Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-26	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-26
Plot Address	Flat 6, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.61	**TER**	12.68
Environmental	96 A	**% DER < TER**			63.64
CO_2 Emissions (t/year)	0.29	**DFEE**	35.21	**TFEE**	36.32
Compliance Check	See BREL	**% DFEE < TFEE**			3.06
% DPER < TPER	29.07	**DPER**	47.55	**TPER**	67.03

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	204.3825	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7000	(17)
Infiltration rate		0.1350	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1148	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1463	0.1434	0.1406	0.1262	0.1234	0.1090	0.1090	0.1061	0.1148	0.1234	0.1291	0.1348	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2823	0.2794	0.2766	0.2622	0.2594	0.2450	0.2450	0.2421	0.2508	0.2594	0.2651	0.2708	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
Brickwork	47.5100	18.4300	29.0800	0.2100	6.1068	110.0000	3198.7998	(29a)
Communal Wall	16.7200	2.0600	14.6600	0.2200	3.2252	110.0000	1612.5999	(29a)
Stairwell Wall	20.3600		20.3600	0.2200	4.4792	110.0000	2239.6001	(29a)
Lift Shaft Wall	8.5400		8.5400	0.0000	0.0000	110.0000	939.4000	(29a)
Terrace Roof	5.7500		5.7500	0.1300	0.7475	9.0000	51.7500	(30)
Total net area of external elements Aum(A, m2)			90.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.8054			(33)
Main dwelling								
Party Wall 1			43.0200	0.0000	0.0000	110.0000	4732.2001	(32)
Party Floor 1			80.1500			70.0000	5610.5000	(32d)
Party Ceiling 1			74.4000			30.0000	2232.0000	(32b)
Internal Wall 1			174.2800			9.0000	1568.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22185.3698	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		276.7981	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.2800	0.0380	1.7966
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	12.7200	0.0540	0.6869
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E25 Staggered party wall between dwellings	6.3600	0.0310	0.1972
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.4900	0.0160	0.2958
E15 Flat roof with parapet	6.8300	0.1500	1.0245
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.1693	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	48.9747	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.0405	18.8470	18.6535	17.6861	17.4926	16.5252	16.5252	16.3317	16.9121	17.4926	17.8796	18.2665	(38)
Heat transfer coeff	68.0152	67.8217	67.6283	66.6608	66.4673	65.4999	65.4999	65.3064	65.8869	66.4673	66.8543	67.2413	(39)
Average = Sum(39)m / 12 =												66.6124	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8486	0.8462	0.8438	0.8317	0.8293	0.8172	0.8172	0.8148	0.8220	0.8293	0.8341	0.8389	(40)
HLP (average)												0.8311	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4657	(42)
Hot water usage for mixer showers	65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)
Hot water usage for baths	28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)
Hot water usage for other uses	39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)
Average daily hot water use (litres/day)												122.9552	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
									Total per year (kWh/year) = Sum(64)m =			2387.1855	(64)
12Total per year (kWh/year)												2387	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8405	122.7163	110.8405	114.5352	110.8405	114.5352	110.8405	110.8405	114.5352	110.8405	114.5352	110.8405	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains	485.2539	496.9674	474.6398	455.7880	430.3338	412.9119	395.4656	396.5358	409.9053	425.7706	454.7941	474.2392	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East			18.4300		19.6403		0.3100		0.0000		0.7700		86.4023 (76)
Solar gains	86.4023	169.0211	278.3537	405.9623	497.5221	509.3024	484.8766	416.5019	323.7369	200.5578	107.7335	71.0530 (83)	
Total gains	571.6562	665.9886	752.9936	861.7504	927.8559	922.2142	880.3422	813.0377	733.6422	626.3285	562.5276	545.2922 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	90.6062	90.8647	91.1247	92.4471	92.7163	94.0857	94.0857	94.3644	93.5331	92.7163	92.1796	91.6491	
alpha	7.0404	7.0576	7.0750	7.1631	7.1811	7.2724	7.2724	7.2910	7.2355	7.1811	7.1453	7.1099	
util living area													
	0.9960	0.9879	0.9594	0.8466	0.6537	0.4538	0.3273	0.3693	0.6121	0.9165	0.9889	0.9971 (86)	
MIT	20.2643	20.4361	20.6644	20.8996	20.9849	20.9990	20.9999	20.9998	20.9928	20.8472	20.5143	20.2377 (87)	
Th 2	20.2114	20.2135	20.2156	20.2259	20.2280	20.2384	20.2384	20.2405	20.2343	20.2280	20.2239	20.2197 (88)	
util rest of house													
	0.9947	0.9840	0.9471	0.8124	0.6039	0.4002	0.2707	0.3084	0.5476	0.8870	0.9846	0.9961 (89)	
MIT 2	19.3555	19.5745	19.8580	20.1341	20.2171	20.2380	20.2384	20.2405	20.2302	20.0869	19.6833	19.3282 (90)	
Living area fraction										fLA = Living area / (4) =		0.3281 (91)	
MIT	19.6537	19.8572	20.1226	20.3853	20.4691	20.4877	20.4883	20.4896	20.4804	20.3364	19.9560	19.6267 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6537	19.8572	20.1226	20.3853	20.4691	20.4877	20.4883	20.4896	20.4804	20.3364	19.9560	19.6267 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9934	0.9818	0.9455	0.8199	0.6197	0.4177	0.2893	0.3284	0.5686	0.8916	0.9827	0.9951 (94)	
Useful gains	567.9074	653.8422	711.9232	706.5067	574.9909	385.2474	254.6609	267.0262	417.1592	558.4523	552.8186	542.6043 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
	1044.2875	1014.4241	921.2726	765.6210	582.8557	385.6434	254.6828	267.0797	420.3854	647.1513	859.4806	1037.3091 (97)	
Space heating kWh													
	354.4268	242.3111	155.7559	42.5623	5.8514	0.0000	0.0000	0.0000	0.0000	65.9920	220.7966	368.0604 (98a)	
Space heating requirement - total per year (kWh/year)												1455.7565	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	354.4268	242.3111	155.7559	42.5623	5.8514	0.0000	0.0000	0.0000	0.0000	65.9920	220.7966	368.0604 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1455.7565	
Space heating per m2											(98c) / (4) =	18.1629 (99)	

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	354.4268	242.3111	155.7559	42.5623	5.8514	0.0000	0.0000	0.0000	0.0000	65.9920	220.7966	368.0604 (98)	
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)													
	354.4268	242.3111	155.7559	42.5623	5.8514	0.0000	0.0000	0.0000	0.0000	65.9920	220.7966	368.0604 (211)	
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement													
	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867 (64)	
Efficiency of water heater												361.6650 (216)	
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)	
Fuel for water heating, kWh/month													
	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417 (231)	
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												1455.7565 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	

Efficiency of water heater	361.6650	
Water heating fuel used	660.0543	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	146.4912	(230a)
Total electricity for the above, kWh/year	146.4912	(231)
Electricity for lighting (calculated in Appendix L)	182.0700	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2444.3721	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1455.7565	0.1577	229.5398	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			322.7158	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			369.3142	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1455.7565	1.5837	2305.4619	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	1.5220	1004.5938	(278)
Space and water heating			3310.0557	(279)
Pumps, fans and electric keep-hot	146.4912	1.5128	221.6118	(281)
Energy for lighting	182.0700	1.5338	279.2651	(282)
Total Primary energy kWh/year			3810.9327	(286)
Dwelling Primary energy Rate (DPER)			47.5500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		204.3825	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1468	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3968	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3373	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4300	0.4216	0.4132	0.3710	0.3626	0.3204	0.3204	0.3120	0.3373	0.3626	0.3794	0.3963	(22b)

Effective ac	0.5925	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.9800	1.1450	20.5878			(27)
Brickwork	47.5100	17.9800	29.5300	0.1800	5.3154			(29a)
Communal Wall	16.7200	2.0600	14.6600	0.1800	2.6388			(29a)
Stairwell Wall	20.3600		20.3600	0.1800	3.6648			(29a)
Lift Shaft Wall	8.5400		8.5400	0.1800	1.5372			(29a)
Terrace Roof	5.7500		5.7500	0.1100	0.6325			(30)
Total net area of external elements Aum(A, m2)			98.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.4365			(33)
Main dwelling								
Party Wall 1			43.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.7981 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	47.2800	0.0700	3.3096	
E18 Party wall between dwellings	6.3600	0.0600	0.3816	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.0200	0.1620	
E16 Corner (normal)	12.7200	0.0900	1.1448	
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0900	-0.8586	
E25 Staggered party wall between dwellings	6.3600	0.0600	0.3816	
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350	
E4 Jamb	18.4900	0.0500	0.9245	
E15 Flat roof with parapet	6.8300	0.5600	3.8248	
E5 Ground floor (normal)	24.5000	0.1600	3.9200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.6253 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.0618 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.9589	39.7168	39.4794	38.3646	38.1560	37.1851	37.1851	37.0052	37.5591	38.1560	38.5780	39.0191	(38)
Heat transfer coeff	90.0207	89.7786	89.5412	88.4264	88.2178	87.2468	87.2468	87.0670	87.6208	88.2178	88.6398	89.0809	(39)
Average = Sum(39)m / 12 =												88.4254	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1232	1.1201	1.1172	1.1033	1.1007	1.0885	1.0885	1.0863	1.0932	1.1007	1.1059	1.1114	(40)
HLP (average)												1.1032	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)
Hot water usage for baths	28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)
Hot water usage for other uses	39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)
Average daily hot water use (litres/day)												122.9552	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.4371	228.4904	242.4427	212.2900	205.2316	184.3133	181.3825	188.8798	191.2935	214.0638	228.5663	255.4866	(62)
WWHRS	-29.9719	-26.5074	-27.7571	-22.9839	-21.4202	-18.3294	-17.1809	-18.2702	-18.9643	-22.3568	-25.3276	-29.4169	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.4652	201.9830	214.6857	189.3061	183.8114	165.9839	164.2016	170.6097	172.3292	191.7070	203.2387	226.0697	(64)
										Total per year (kWh/year) = Sum(64)m =		2312.3912	(64)
12Total per year (kWh/year)												2312	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	107.7135	95.6481	102.3953	91.6669	90.0226	82.3646	82.0928	84.5857	84.6855	92.9593	97.0787	106.7324	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8291	122.7036	110.8291	114.5234	110.8291	114.5234	110.8291	110.8291	114.5234	110.8291	114.5234	110.8291	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)													
	144.7762	142.3335	137.6281	127.3151	120.9981	114.3953	110.3398	113.6904	117.6188	124.9453	134.8316	143.4576	(72)
Total internal gains													
	538.3445	550.0568	527.7304	508.8782	483.4244	463.0020	445.5561	446.6264	459.9955	478.8612	507.8843	527.3298	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	17.9800	19.6403	0.6300	0.7000	0.7700	107.9217	(76)

Solar gains	107.9217	211.1178	347.6809	507.0718	621.4356	636.1499	605.6406	520.2364	404.3673	250.5090	134.5657	88.7496	(83)
Total gains	646.2662	761.1745	875.4113	1015.9501	1104.8600	1099.1519	1051.1968	966.8627	864.3627	729.3702	642.4500	616.0793	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.4576	68.6422	68.8242	69.6919	69.8567	70.6341	70.6341	70.7800	70.3326	69.8567	69.5241	69.1798	
alpha	5.5638	5.5761	5.5883	5.6461	5.6571	5.7089	5.7089	5.7187	5.6888	5.6571	5.6349	5.6120	
util living area													
	0.9948	0.9866	0.9611	0.8706	0.7014	0.5027	0.3645	0.4127	0.6692	0.9285	0.9876	0.9959	(86)
MIT	19.9343	20.1394	20.4334	20.7695	20.9435	20.9928	20.9990	20.9981	20.9674	20.7013	20.2577	19.9042	(87)
Th 2	19.9820	19.9844	19.9868	19.9982	20.0003	20.0102	20.0102	20.0120	20.0064	20.0003	19.9960	19.9915	(88)
util rest of house													
	0.9929	0.9820	0.9482	0.8344	0.6394	0.4275	0.2829	0.3249	0.5853	0.8986	0.9826	0.9945	(89)
MIT 2	18.7582	19.0195	19.3862	19.7851	19.9592	20.0067	20.0099	20.0115	19.9879	19.7229	19.1802	18.7271	(90)
Living area fraction										fLA = Living area / (4) =		0.3281	(91)
MIT	19.1441	19.3870	19.7298	20.1081	20.2822	20.3303	20.3345	20.3352	20.3093	20.0439	19.5337	19.1133	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1441	19.3870	19.7298	20.1081	20.2822	20.3303	20.3345	20.3352	20.3093	20.0439	19.5337	19.1133	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9909	0.9785	0.9443	0.8388	0.6576	0.4521	0.3097	0.3538	0.6119	0.9001	0.9795	0.9928	(94)
Useful gains	640.3538	744.7722	826.6114	852.1955	726.5465	496.8981	325.5429	342.0415	528.8964	656.5072	629.2812	611.6241	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1336.2784	1300.6217	1184.6141	991.0942	757.0999	499.9491	325.8234	342.6287	544.0626	833.1234	1102.1240	1328.4933	(97)
Space heating kWh													
	517.7679	373.5309	266.3540	100.0071	22.7318	0.0000	0.0000	0.0000	0.0000	131.4024	340.4468	533.3506	(98a)
Space heating requirement - total per year (kWh/year)												2285.5915	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.7679	373.5309	266.3540	100.0071	22.7318	0.0000	0.0000	0.0000	0.0000	131.4024	340.4468	533.3506	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2285.5915	
Space heating per m2											(98c) / (4) =	28.5164	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.7679	373.5309	266.3540	100.0071	22.7318	0.0000	0.0000	0.0000	0.0000	131.4024	340.4468	533.3506	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.9620	404.6922	288.5742	108.3501	24.6281	0.0000	0.0000	0.0000	0.0000	142.3645	368.8481	577.8447	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	228.4652	201.9830	214.6857	189.3061	183.8114	165.9839	164.2016	170.6097	172.3292	191.7070	203.2387	226.0697	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8362	85.4189	84.5445	82.6972	80.7002	79.8000	79.8000	79.8000	79.8000	83.2306	85.2077	85.9155	(217)
Fuel for water heating, kWh/month													
	266.1643	236.4616	253.9321	228.9147	227.7707	207.9998	205.7664	213.7966	215.9514	230.3324	238.5217	263.1304	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.0281	18.4740	16.6338	12.1866	9.4133	7.6907	8.5871	11.1619	14.4982	19.0224	21.4857	23.6681	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3577	-31.5802	-47.5826	-56.1624	-62.8907	-59.5473	-58.8114	-54.3583	-46.9199	-37.2652	-23.9936	-18.2969	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9812	-17.1319	-34.6992	-53.0827	-71.1471	-71.8453	-71.0093	-59.6908	-43.1804	-24.8245	-10.7585	-6.2867	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2476.2639	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2788.7420	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	185.8499	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-990.4037	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4546.4521	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2476.2639	0.2100	520.0154	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2788.7420	0.2100	585.6358	(264)
Space and water heating			1105.6512	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	185.8499	0.1443	26.8239	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.7662	0.1336	-69.3067	
PV Unit electricity exported	-471.6375	0.1254	-59.1233	
Total			-128.4300	(269)
Total CO2, kg/year			1015.9744	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2476.2639	1.1300	2798.1782	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2788.7420	1.1300	3151.2785	(278)
Space and water heating			5949.4566	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	185.8499	1.5338	285.0627	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.7662	1.4937	-774.8827	
PV Unit electricity exported	-471.6375	0.4601	-217.0111	
Total			-991.8938	(283)
Total Primary energy kWh/year			5372.7264	(286)
Target Primary Energy Rate (TPER)			67.0300	(287)

Full SAP Calculation Printout

Plot Reference	P-26	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-26
Plot Address	Flat 6, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.61	**TER**	12.68
Environmental	96 A	**% DER < TER**			63.64
CO_2 Emissions (t/year)	0.29	**DFEE**	35.21	**TFEE**	36.32
Compliance Check	See BREL	**% DFEE < TFEE**			3.06
% DPER < TPER	29.07	**DPER**	47.55	**TPER**	67.03

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	204.3825	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1468	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7000	(17)
Infiltration rate		0.2818	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2395	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3054	0.2994	0.2934	0.2635	0.2575	0.2275	0.2275	0.2216	0.2395	0.2575	0.2695	0.2814	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5466	0.5448	0.5430	0.5347	0.5331	0.5259	0.5259	0.5245	0.5287	0.5331	0.5363	0.5396	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
Brickwork	47.5100	18.4300	29.0800	0.2100	6.1068	110.0000	3198.7998	(29a)
Communal Wall	16.7200	2.0600	14.6600	0.2200	3.2252	110.0000	1612.5999	(29a)
Stairwell Wall	20.3600		20.3600	0.2200	4.4792	110.0000	2239.6001	(29a)
Lift Shaft Wall	8.5400		8.5400	0.0000	0.0000	110.0000	939.4000	(29a)
Terrace Roof	5.7500		5.7500	0.1300	0.7475	9.0000	51.7500	(30)
Total net area of external elements Aum(A, m2)			90.3400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.8054			(33)
Main dwelling								
Party Wall 1			43.0200	0.0000	0.0000	110.0000	4732.2001	(32)
Party Floor 1			80.1500			70.0000	5610.5000	(32d)
Party Ceiling 1			74.4000			30.0000	2232.0000	(32b)
Internal Wall 1			174.2800			9.0000	1568.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22185.3698 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		276.7981 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.2800	0.0380	1.7966
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	12.7200	0.0540	0.6869
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E25 Staggered party wall between dwellings	6.3600	0.0310	0.1972
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.4900	0.0160	0.2958
E15 Flat roof with parapet	6.8300	0.1500	1.0245
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1693 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.9747 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.8681	36.7460	36.6263	36.0640	35.9588	35.4691	35.4691	35.3784	35.6577	35.9588	36.1716	36.3941	(38)
Heat transfer coeff	85.8428	85.7207	85.6010	85.0387	84.9335	84.4438	84.4438	84.3532	84.6325	84.9335	85.1464	85.3688	(39)
Average = Sum(39)m / 12 =												85.0382	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0710	1.0695	1.0680	1.0610	1.0597	1.0536	1.0536	1.0524	1.0559	1.0597	1.0623	1.0651	(40)
HLP (average)												1.0610	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day) 62.5098 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1980	66.3272	64.2848	61.7426	59.4748	57.1179	56.6282	58.6665	60.7571	63.1774	65.7421	68.1023	(44)
Energy conte	108.0090	94.4491	98.8034	84.5226	80.0645	70.2332	68.4869	72.6414	74.9195	85.7311	93.6616	106.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1038.1541	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

91.8076	80.2818	83.9829	71.8442	68.0548	59.6982	58.2139	61.7452	63.6816	72.8715	79.6124	90.6370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

91.8076	80.2818	83.9829	71.8442	68.0548	59.6982	58.2139	61.7452	63.6816	72.8715	79.6124	90.6370	(64)

Total per year (kWh/year) = Sum(64)m = 882.4310 (64)
12Total per year (kWh/year) 882 (64)
Electric shower(s)

52.5038	46.7813	51.0834	48.7482	49.6630	47.3737	48.9528	49.6630	48.7482	51.0834	50.1228	52.5038	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 597.2272 (64a)
Heat gains from water heating, kWh/month

36.0779	31.7658	33.7666	30.1481	29.4295	26.7680	26.7917	27.8520	28.1075	30.9887	32.4338	35.7852	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8405	122.7163	110.8405	114.5352	110.8405	114.5352	110.8405	110.8405	114.5352	110.8405	114.5352	110.8405	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	48.4917	47.2705	45.3852	41.8724	39.5557	37.1777	36.0103	37.4355	39.0381	41.6515	45.0469	48.0984	(72)
Total internal gains	439.0715	452.0064	432.4989	420.4473	398.9935	385.7963	371.2381	370.3830	381.4267	392.5788	415.1115	428.9821	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	19.6403	0.3100	0.0000	0.7700	86.4023	(76)

Solar gains	86.4023	169.0211	278.3537	405.9623	497.5221	509.3024	484.8766	416.5019	323.7369	200.5578	107.7335	71.0530	(83)
Total gains	525.4738	621.0276	710.8526	826.4097	896.5155	895.0987	856.1147	786.8849	705.1636	593.1366	522.8450	500.0351	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.7894	71.8917	71.9922	72.4682	72.5579	72.9787	72.9787	73.0572	72.8161	72.5579	72.3766	72.1880	
alpha	5.7860	5.7928	5.7995	5.8312	5.8372	5.8652	5.8652	5.8705	5.8544	5.8372	5.8251	5.8125	
util living area	0.9981	0.9946	0.9828	0.9294	0.7947	0.5910	0.4322	0.4891	0.7631	0.9656	0.9952	0.9986	(86)
MIT	19.8640	20.0471	20.3216	20.6734	20.9030	20.9856	20.9980	20.9961	20.9425	20.6112	20.1701	19.8307	(87)
Th 2	20.0246	20.0258	20.0270	20.0328	20.0339	20.0389	20.0389	20.0399	20.0370	20.0339	20.0317	20.0294	(88)
util rest of house	0.9974	0.9926	0.9764	0.9049	0.7373	0.5081	0.3388	0.3892	0.6813	0.9485	0.9931	0.9980	(89)
MIT 2	18.9928	19.1757	19.4471	19.7838	19.9753	20.0333	20.0385	20.0389	20.0094	19.7351	19.3036	18.9634	(90)
Living area fraction										fLA = Living area / (4) =		0.3281	(91)
MIT	19.2787	19.4616	19.7341	20.0757	20.2797	20.3458	20.3534	20.3530	20.3156	20.0226	19.5879	19.2480	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2787	19.4616	19.7341	20.0757	20.2797	20.3458	20.3534	20.3530	20.3156	20.0226	19.5879	19.2480	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9911	0.9739	0.9061	0.7529	0.5351	0.3695	0.4222	0.7066	0.9483	0.9918	0.9975	(94)
Useful gains	523.7167	615.5100	692.3256	748.8368	675.0009	478.9815	316.3596	332.2013	498.2857	562.4613	518.5582	498.7653	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1285.8108	1248.2336	1132.8487	950.3706	728.7065	485.1955	316.9478	333.4482	526.0417	800.2935	1063.3001	1284.6279	(97)
Space heating kWh	566.9980	425.1902	327.7492	145.1043	39.9569	0.0000	0.0000	0.0000	0.0000	176.9471	392.2141	584.6818	(98a)
Space heating requirement - total per year (kWh/year)												2658.8417	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	566.9980	425.1902	327.7492	145.1043	39.9569	0.0000	0.0000	0.0000	0.0000	176.9471	392.2141	584.6818	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2658.8417	
Space heating per m2											(98c) / (4) =	33.1733	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	793.7722	624.8845	641.0840	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9340	0.9703	0.9526	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	741.3663	606.3461	610.7077	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1003.5858	960.1781	881.4233	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	188.7981	263.2510	201.4124	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	47.1995	65.8127	50.3531	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												163.3654	(107)
Energy for space heating												33.1733	(99)
Energy for space cooling												2.0382	(108)
Total												35.2116	(109)
Fabric Energy Efficiency (DFEE)												35.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		204.3825	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1468	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3968	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3373	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4300	0.4216	0.4132	0.3710	0.3626	0.3204	0.3204	0.3120	0.3373	0.3626	0.3794	0.3963	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5925	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.9800	1.1450	20.5878			(27)
Brickwork	47.5100	17.9800	29.5300	0.1800	5.3154			(29a)
Communal Wall	16.7200	2.0600	14.6600	0.1800	2.6388			(29a)
Stairwell Wall	20.3600		20.3600	0.1800	3.6648			(29a)
Lift Shaft Wall	8.5400		8.5400	0.1800	1.5372			(29a)
Terrace Roof	5.7500		5.7500	0.1100	0.6325			(30)
Total net area of external elements Aum(A, m2)			98.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.4365			(33)
Main dwelling								
Party Wall 1			43.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	276.7981 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	47.2800	0.0700	3.3096
E18 Party wall between dwellings	6.3600	0.0600	0.3816
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.0200	0.1620
E16 Corner (normal)	12.7200	0.0900	1.1448
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0900	-0.8586
E25 Staggered party wall between dwellings	6.3600	0.0600	0.3816
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.4900	0.0500	0.9245
E15 Flat roof with parapet	6.8300	0.5600	3.8248
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.6253 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.0618 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.9589	39.7168	39.4794	38.3646	38.1560	37.1851	37.1851	37.0052	37.5591	38.1560	38.5780	39.0191	(38)
Heat transfer coeff													
	90.0207	89.7786	89.5412	88.4264	88.2178	87.2468	87.2468	87.0670	87.6208	88.2178	88.6398	89.0809	(39)
Average = Sum(39)m / 12 =												88.4254	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1232	1.1201	1.1172	1.1033	1.1007	1.0885	1.0885	1.0863	1.0932	1.1007	1.1059	1.1114	(40)
HLP (average)												1.1032	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4657 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day)	62.5098 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	68.1980	66.3272	64.2848	61.7426	59.4748	57.1179	56.6282	58.6665	60.7571	63.1774	65.7421	68.1023	(44)
Energy conte	108.0090	94.4491	98.8034	84.5226	80.0645	70.2332	68.4869	72.6414	74.9195	85.7311	93.6616	106.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1038.1541	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

91.8076	80.2818	83.9829	71.8442	68.0548	59.6982	58.2139	61.7452	63.6816	72.8715	79.6124	90.6370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	91.8076	80.2818	83.9829	71.8442	68.0548	59.6982	58.2139	61.7452	63.6816	72.8715	79.6124	90.6370	(64)
									Total per year (kWh/year) = Sum(64)m =			882.4310	(64)
12Total per year (kWh/year)												882	(64)

Electric shower(s)

52.5038	46.7813	51.0834	48.7482	49.6630	47.3737	48.9528	49.6630	48.7482	51.0834	50.1228	52.5038	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 597.2272 (64a)

Heat gains from water heating, kWh/month

	36.0779	31.7658	33.7666	30.1481	29.4295	26.7680	26.7917	27.8520	28.1075	30.9887	32.4338	35.7852 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	110.8291	122.7036	110.8291	114.5234	110.8291	114.5234	110.8291	110.8291	114.5234	110.8291	114.5234	110.8291 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280 (71)

Water heating gains (Table 5)

	48.4917	47.2705	45.3852	41.8724	39.5557	37.1777	36.0103	37.4355	39.0381	41.6515	45.0469	48.0984 (72)

Total internal gains

	439.0601	451.9937	432.4874	420.4355	398.9820	385.7845	371.2266	370.3715	381.4148	392.5673	415.0996	428.9706 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	17.9800	19.6403	0.6300	0.7000	0.7700	107.9217	(76)

Solar gains	107.9217	211.1178	347.6809	507.0718	621.4356	636.1499	605.6406	520.2364	404.3673	250.5090	134.5657	88.7496	(83)
Total gains	546.9818	663.1115	780.1683	927.5073	1020.4176	1021.9344	976.8673	890.6079	785.7821	643.0764	549.6653	517.7201	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.4576	68.6422	68.8242	69.6919	69.8567	70.6341	70.6341	70.7800	70.3326	69.8567	69.5241	69.1798	
alpha	5.5638	5.5761	5.5883	5.6461	5.6571	5.7089	5.7089	5.7187	5.6888	5.6571	5.6349	5.6120	
util living area	0.9977	0.9929	0.9760	0.9031	0.7441	0.5384	0.3918	0.4471	0.7211	0.9558	0.9941	0.9983	(86)
MIT	19.8139	20.0248	20.3343	20.7113	20.9240	20.9898	20.9986	20.9971	20.9528	20.6235	20.1483	19.7842	(87)
Th 2	19.9820	19.9844	19.9868	19.9982	20.0003	20.0102	20.0102	20.0120	20.0064	20.0003	19.9960	19.9915	(88)
util rest of house	0.9969	0.9904	0.9674	0.8724	0.6828	0.4589	0.3043	0.3525	0.6363	0.9347	0.9916	0.9977	(89)
MIT 2	18.9088	19.1201	19.4253	19.7842	19.9561	20.0063	20.0099	20.0114	19.9846	19.7166	19.2531	18.8868	(90)
Living area fraction									fLA = Living area / (4) =			0.3281	(91)
MIT	19.2058	19.4169	19.7236	20.0884	20.2737	20.3290	20.3343	20.3348	20.3023	20.0142	19.5468	19.1812	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2058	19.4169	19.7236	20.0884	20.2737	20.3290	20.3343	20.3348	20.3023	20.0142	19.5468	19.1812	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9960	0.9885	0.9646	0.8755	0.7004	0.4849	0.3331	0.3837	0.6630	0.9351	0.9900	0.9970	(94)
Useful gains	544.7769	655.4976	752.5432	812.0658	714.7129	495.4999	325.3969	341.6998	520.9715	601.3197	544.1720	516.1575	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1341.8335	1303.3090	1184.0558	989.3495	756.3545	499.8411	325.8086	342.5949	543.4500	830.4993	1103.2845	1334.5415	(97)
Space heating kWh	593.0101	435.3293	321.0454	127.6442	30.9814	0.0000	0.0000	0.0000	0.0000	170.5096	402.5610	608.8777	(98a)
Space heating requirement - total per year (kWh/year)												2689.9587	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	593.0101	435.3293	321.0454	127.6442	30.9814	0.0000	0.0000	0.0000	0.0000	170.5096	402.5610	608.8777	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2689.9587	
Space heating per m2											(98c) / (4) =	33.5616	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	820.1203	645.6266	661.7095	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9539	0.9798	0.9664	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	782.2749	632.5986	639.4501	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1151.8482	1101.3297	1002.6700	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	266.0928	348.7360	270.2356	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	66.5232	87.1840	67.5589	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												221.2661	(107)
Energy for space heating												33.5616	(99)
Energy for space cooling												2.7606	(108)
Total												36.3222	(109)

Full SAP Calculation Printout

Plot Reference	P-26	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-26
Plot Address	Flat 6, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.61	**TER**	12.68
Environmental	96 A	**% DER < TER**			63.64
CO_2 Emissions (t/year)	0.29	**DFEE**	35.21	**TFEE**	36.32
Compliance Check	See BREL	**% DFEE < TFEE**			3.06
% DPER < TPER	29.07	**DPER**	47.55	**TPER**	67.03

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	204.3825	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7000	(17)
Infiltration rate		0.1350	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1148	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1463	0.1434	0.1406	0.1262	0.1234	0.1090	0.1090	0.1061	0.1148	0.1234	0.1291	0.1348	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2823	0.2794	0.2766	0.2622	0.2594	0.2450	0.2450	0.2421	0.2508	0.2594	0.2651	0.2708	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
Brickwork	47.5100	18.4300	29.0800	0.2100	6.1068	110.0000	3198.7998	(29a)
Communal Wall	16.7200	2.0600	14.6600	0.2200	3.2252	110.0000	1612.5999	(29a)
Stairwell Wall	20.3600		20.3600	0.2200	4.4792	110.0000	2239.6001	(29a)
Lift Shaft Wall	8.5400		8.5400	0.0000	0.0000	110.0000	939.4000	(29a)
Terrace Roof	5.7500		5.7500	0.1300	0.7475	9.0000	51.7500	(30)
Total net area of external elements Aum(A, m2)			90.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.8054			(33)
Main dwelling								
Party Wall 1			43.0200	0.0000	0.0000	110.0000	4732.2001	(32)
Party Floor 1			80.1500			70.0000	5610.5000	(32d)
Party Ceiling 1			74.4000			30.0000	2232.0000	(32b)
Internal Wall 1			174.2800			9.0000	1568.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22185.3698	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		276.7981	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.2800	0.0380	1.7966
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	12.7200	0.0540	0.6869
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E25 Staggered party wall between dwellings	6.3600	0.0310	0.1972
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.4900	0.0160	0.2958
E15 Flat roof with parapet	6.8300	0.1500	1.0245
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.1693	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	48.9747	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.0405	18.8470	18.6535	17.6861	17.4926	16.5252	16.5252	16.3317	16.9121	17.4926	17.8796	18.2665	(38)
Heat transfer coeff	68.0152	67.8217	67.6283	66.6608	66.4673	65.4999	65.4999	65.3064	65.8869	66.4673	66.8543	67.2413	(39)
Average = Sum(39)m / 12 =												66.6124	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8486	0.8462	0.8438	0.8317	0.8293	0.8172	0.8172	0.8148	0.8220	0.8293	0.8341	0.8389	(40)
HLP (average)												0.8311	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4657	(42)
Hot water usage for mixer showers	65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)
Hot water usage for baths	28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)
Hot water usage for other uses	39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)
Average daily hot water use (litres/day)												122.9552	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
									Total per year (kWh/year) = Sum(64)m =			2387.1855	(64)
12Total per year (kWh/year)												2387	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8405	122.7163	110.8405	114.5352	110.8405	114.5352	110.8405	110.8405	114.5352	110.8405	114.5352	110.8405	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains	485.2539	496.9674	474.6398	455.7880	430.3338	412.9119	395.4656	396.5358	409.9053	425.7706	454.7941	474.2392	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East			18.4300		19.6403		0.3100		0.0000		0.7700		86.4023 (76)
Solar gains	86.4023	169.0211	278.3537	405.9623	497.5221	509.3024	484.8766	416.5019	323.7369	200.5578	107.7335	71.0530 (83)	
Total gains	571.6562	665.9886	752.9936	861.7504	927.8559	922.2142	880.3422	813.0377	733.6422	626.3285	562.5276	545.2922 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	90.6062	90.8647	91.1247	92.4471	92.7163	94.0857	94.0857	94.3644	93.5331	92.7163	92.1796	91.6491	
alpha	7.0404	7.0576	7.0750	7.1631	7.1811	7.2724	7.2724	7.2910	7.2355	7.1811	7.1453	7.1099	
util living area													
	0.9960	0.9879	0.9594	0.8466	0.6537	0.4538	0.3273	0.3693	0.6121	0.9165	0.9889	0.9971 (86)	
MIT	20.2643	20.4361	20.6644	20.8996	20.9849	20.9990	20.9999	20.9998	20.9928	20.8472	20.5143	20.2377 (87)	
Th 2	20.2114	20.2135	20.2156	20.2259	20.2280	20.2384	20.2384	20.2405	20.2343	20.2280	20.2239	20.2197 (88)	
util rest of house													
	0.9947	0.9840	0.9471	0.8124	0.6039	0.4002	0.2707	0.3084	0.5476	0.8870	0.9846	0.9961 (89)	
MIT 2	19.3555	19.5745	19.8580	20.1341	20.2171	20.2380	20.2384	20.2405	20.2302	20.0869	19.6833	19.3282 (90)	
Living area fraction										fLA = Living area / (4) =		0.3281 (91)	
MIT	19.6537	19.8572	20.1226	20.3853	20.4691	20.4877	20.4883	20.4896	20.4804	20.3364	19.9560	19.6267 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6537	19.8572	20.1226	20.3853	20.4691	20.4877	20.4883	20.4896	20.4804	20.3364	19.9560	19.6267 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9934	0.9818	0.9455	0.8199	0.6197	0.4177	0.2893	0.3284	0.5686	0.8916	0.9827	0.9951 (94)	
Useful gains	567.9074	653.8422	711.9232	706.5067	574.9909	385.2474	254.6609	267.0262	417.1592	558.4523	552.8186	542.6043 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
	1044.2875	1014.4241	921.2726	765.6210	582.8557	385.6434	254.6828	267.0797	420.3854	647.1513	859.4806	1037.3091 (97)	
Space heating kWh													
	354.4268	242.3111	155.7559	42.5623	5.8514	0.0000	0.0000	0.0000	0.0000	65.9920	220.7966	368.0604 (98a)	
Space heating requirement - total per year (kWh/year)												1455.7565	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	354.4268	242.3111	155.7559	42.5623	5.8514	0.0000	0.0000	0.0000	0.0000	65.9920	220.7966	368.0604 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1455.7565	
Space heating per m2											(98c) / (4) =	18.1629 (99)	

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	354.4268	242.3111	155.7559	42.5623	5.8514	0.0000	0.0000	0.0000	0.0000	65.9920	220.7966	368.0604 (98)	
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)													
	354.4268	242.3111	155.7559	42.5623	5.8514	0.0000	0.0000	0.0000	0.0000	65.9920	220.7966	368.0604 (211)	
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement													
	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867 (64)	
Efficiency of water heater												361.6650 (216)	
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)	
Fuel for water heating, kWh/month													
	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417 (231)	
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												1455.7565 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	

Efficiency of water heater	361.6650	
Water heating fuel used	660.0543	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	146.4912	(230a)
Total electricity for the above, kWh/year	146.4912	(231)
Electricity for lighting (calculated in Appendix L)	182.0700	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2444.3721	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1455.7565	0.1577	229.5398	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			322.7158	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			369.3142	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1455.7565	1.5837	2305.4619	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	1.5220	1004.5938	(278)
Space and water heating			3310.0557	(279)
Pumps, fans and electric keep-hot	146.4912	1.5128	221.6118	(281)
Energy for lighting	182.0700	1.5338	279.2651	(282)
Total Primary energy kWh/year			3810.9327	(286)
Dwelling Primary energy Rate (DPER)			47.5500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		204.3825	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1468	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3968	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3373	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4300	0.4216	0.4132	0.3710	0.3626	0.3204	0.3204	0.3120	0.3373	0.3626	0.3794	0.3963	(22b)

Effective ac	0.5925	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.9800	1.1450	20.5878			(27)
Brickwork	47.5100	17.9800	29.5300	0.1800	5.3154			(29a)
Communal Wall	16.7200	2.0600	14.6600	0.1800	2.6388			(29a)
Stairwell Wall	20.3600		20.3600	0.1800	3.6648			(29a)
Lift Shaft Wall	8.5400		8.5400	0.1800	1.5372			(29a)
Terrace Roof	5.7500		5.7500	0.1100	0.6325			(30)
Total net area of external elements Aum(A, m2)			98.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.4365			(33)
Main dwelling								
Party Wall 1			43.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.7981 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	47.2800	0.0700	3.3096	
E18 Party wall between dwellings	6.3600	0.0600	0.3816	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.0200	0.1620	
E16 Corner (normal)	12.7200	0.0900	1.1448	
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0900	-0.8586	
E25 Staggered party wall between dwellings	6.3600	0.0600	0.3816	
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350	
E4 Jamb	18.4900	0.0500	0.9245	
E15 Flat roof with parapet	6.8300	0.5600	3.8248	
E5 Ground floor (normal)	24.5000	0.1600	3.9200	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.6253 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.0618 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.9589	39.7168	39.4794	38.3646	38.1560	37.1851	37.1851	37.0052	37.5591	38.1560	38.5780	39.0191	(38)
Heat transfer coeff	90.0207	89.7786	89.5412	88.4264	88.2178	87.2468	87.2468	87.0670	87.6208	88.2178	88.6398	89.0809	(39)
Average = Sum(39)m / 12 =												88.4254	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1232	1.1201	1.1172	1.1033	1.1007	1.0885	1.0885	1.0863	1.0932	1.1007	1.1059	1.1114	(40)
HLP (average)												1.1032	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)
Hot water usage for baths	28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)
Hot water usage for other uses	39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)
Average daily hot water use (litres/day)												122.9552	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.4371	228.4904	242.4427	212.2900	205.2316	184.3133	181.3825	188.8798	191.2935	214.0638	228.5663	255.4866	(62)
WWHRS	-29.9719	-26.5074	-27.7571	-22.9839	-21.4202	-18.3294	-17.1809	-18.2702	-18.9643	-22.3568	-25.3276	-29.4169	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.4652	201.9830	214.6857	189.3061	183.8114	165.9839	164.2016	170.6097	172.3292	191.7070	203.2387	226.0697	(64)
										Total per year (kWh/year) = Sum(64)m =		2312.3912	(64)
12Total per year (kWh/year)												2312	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	107.7135	95.6481	102.3953	91.6669	90.0226	82.3646	82.0928	84.5857	84.6855	92.9593	97.0787	106.7324	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	123.2851	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.8291	122.7036	110.8291	114.5234	110.8291	114.5234	110.8291	110.8291	114.5234	110.8291	114.5234	110.8291	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	219.7538	222.0341	216.2877	204.0542	188.6117	174.0979	164.4018	162.1214	167.8678	180.1013	195.5438	210.0576	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	35.3285	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)													
	144.7762	142.3335	137.6281	127.3151	120.9981	114.3953	110.3398	113.6904	117.6188	124.9453	134.8316	143.4576	(72)
Total internal gains													
	538.3445	550.0568	527.7304	508.8782	483.4244	463.0020	445.5561	446.6264	459.9955	478.8612	507.8843	527.3298	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	17.9800	19.6403	0.6300	0.7000	0.7700	107.9217	(76)

Solar gains	107.9217	211.1178	347.6809	507.0718	621.4356	636.1499	605.6406	520.2364	404.3673	250.5090	134.5657	88.7496	(83)
Total gains	646.2662	761.1745	875.4113	1015.9501	1104.8600	1099.1519	1051.1968	966.8627	864.3627	729.3702	642.4500	616.0793	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.4576	68.6422	68.8242	69.6919	69.8567	70.6341	70.6341	70.7800	70.3326	69.8567	69.5241	69.1798	
alpha	5.5638	5.5761	5.5883	5.6461	5.6571	5.7089	5.7089	5.7187	5.6888	5.6571	5.6349	5.6120	
util living area													
	0.9948	0.9866	0.9611	0.8706	0.7014	0.5027	0.3645	0.4127	0.6692	0.9285	0.9876	0.9959	(86)
MIT	19.9343	20.1394	20.4334	20.7695	20.9435	20.9928	20.9990	20.9981	20.9674	20.7013	20.2577	19.9042	(87)
Th 2	19.9820	19.9844	19.9868	19.9982	20.0003	20.0102	20.0102	20.0120	20.0064	20.0003	19.9960	19.9915	(88)
util rest of house													
	0.9929	0.9820	0.9482	0.8344	0.6394	0.4275	0.2829	0.3249	0.5853	0.8986	0.9826	0.9945	(89)
MIT 2	18.7582	19.0195	19.3862	19.7851	19.9592	20.0067	20.0099	20.0115	19.9879	19.7229	19.1802	18.7271	(90)
Living area fraction										fLA = Living area / (4) =		0.3281	(91)
MIT	19.1441	19.3870	19.7298	20.1081	20.2822	20.3303	20.3345	20.3352	20.3093	20.0439	19.5337	19.1133	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1441	19.3870	19.7298	20.1081	20.2822	20.3303	20.3345	20.3352	20.3093	20.0439	19.5337	19.1133	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9909	0.9785	0.9443	0.8388	0.6576	0.4521	0.3097	0.3538	0.6119	0.9001	0.9795	0.9928	(94)
Useful gains	640.3538	744.7722	826.6114	852.1955	726.5465	496.8981	325.5429	342.0415	528.8964	656.5072	629.2812	611.6241	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1336.2784	1300.6217	1184.6141	991.0942	757.0999	499.9491	325.8234	342.6287	544.0626	833.1234	1102.1240	1328.4933	(97)
Space heating kWh													
	517.7679	373.5309	266.3540	100.0071	22.7318	0.0000	0.0000	0.0000	0.0000	131.4024	340.4468	533.3506	(98a)
Space heating requirement - total per year (kWh/year)												2285.5915	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	517.7679	373.5309	266.3540	100.0071	22.7318	0.0000	0.0000	0.0000	0.0000	131.4024	340.4468	533.3506	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2285.5915	
Space heating per m2											(98c) / (4) =	28.5164	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	517.7679	373.5309	266.3540	100.0071	22.7318	0.0000	0.0000	0.0000	0.0000	131.4024	340.4468	533.3506	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	560.9620	404.6922	288.5742	108.3501	24.6281	0.0000	0.0000	0.0000	0.0000	142.3645	368.8481	577.8447	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	228.4652	201.9830	214.6857	189.3061	183.8114	165.9839	164.2016	170.6097	172.3292	191.7070	203.2387	226.0697	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8362	85.4189	84.5445	82.6972	80.7002	79.8000	79.8000	79.8000	79.8000	83.2306	85.2077	85.9155	(217)
Fuel for water heating, kWh/month													
	266.1643	236.4616	253.9321	228.9147	227.7707	207.9998	205.7664	213.7966	215.9514	230.3324	238.5217	263.1304	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.0281	18.4740	16.6338	12.1866	9.4133	7.6907	8.5871	11.1619	14.4982	19.0224	21.4857	23.6681	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3577	-31.5802	-47.5826	-56.1624	-62.8907	-59.5473	-58.8114	-54.3583	-46.9199	-37.2652	-23.9936	-18.2969	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9812	-17.1319	-34.6992	-53.0827	-71.1471	-71.8453	-71.0093	-59.6908	-43.1804	-24.8245	-10.7585	-6.2867	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2476.2639	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2788.7420	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	185.8499	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-990.4037	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4546.4521	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2476.2639	0.2100	520.0154	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2788.7420	0.2100	585.6358	(264)
Space and water heating			1105.6512	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	185.8499	0.1443	26.8239	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.7662	0.1336	-69.3067	
PV Unit electricity exported	-471.6375	0.1254	-59.1233	
Total			-128.4300	(269)
Total CO2, kg/year			1015.9744	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2476.2639	1.1300	2798.1782	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2788.7420	1.1300	3151.2785	(278)
Space and water heating			5949.4566	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	185.8499	1.5338	285.0627	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.7662	1.4937	-774.8827	
PV Unit electricity exported	-471.6375	0.4601	-217.0111	
Total			-991.8938	(283)
Total Primary energy kWh/year			5372.7264	(286)
Target Primary Energy Rate (TPER)			67.0300	(287)

Full SAP Calculation Printout

Plot Reference	P-26	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-26
Plot Address	Flat 6, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.61	**TER**	12.68
Environmental	96 A	**% DER < TER**			63.64
CO_2 Emissions (t/year)	0.29	**DFEE**	35.21	**TFEE**	36.32
Compliance Check	See BREL	**% DFEE < TFEE**			3.06
% DPER < TPER	29.07	**DPER**	47.55	**TPER**	67.03

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b)	x 2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	204.3825	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7000	(17)
Infiltration rate		0.1350	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1148	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1463	0.1434	0.1406	0.1262	0.1234	0.1090	0.1090	0.1061	0.1148	0.1234	0.1291	0.1348	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2823	0.2794	0.2766	0.2622	0.2594	0.2450	0.2450	0.2421	0.2508	0.2594	0.2651	0.2708	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
Brickwork	47.5100	18.4300	29.0800	0.2100	6.1068	110.0000	3198.7998	(29a)
Communal Wall	16.7200	2.0600	14.6600	0.2200	3.2252	110.0000	1612.5999	(29a)
Stairwell Wall	20.3600		20.3600	0.2200	4.4792	110.0000	2239.6001	(29a)
Lift Shaft Wall	8.5400		8.5400	0.0000	0.0000	110.0000	939.4000	(29a)
Terrace Roof	5.7500		5.7500	0.1300	0.7475	9.0000	51.7500	(30)
Total net area of external elements Aum(A, m2)			90.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.8054			(33)
Main dwelling								
Party Wall 1			43.0200	0.0000	0.0000	110.0000	4732.2001	(32)
Party Floor 1			80.1500			70.0000	5610.5000	(32d)
Party Ceiling 1			74.4000			30.0000	2232.0000	(32b)
Internal Wall 1			174.2800			9.0000	1568.5200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22185.3698 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.7981 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.2800	0.0380	1.7966
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	12.7200	0.0540	0.6869
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E25 Staggered party wall between dwellings	6.3600	0.0310	0.1972
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.4900	0.0160	0.2958
E15 Flat roof with parapet	6.8300	0.1500	1.0245
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1693 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.9747 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.0405	18.8470	18.6535	17.6861	17.4926	16.5252	16.5252	16.3317	16.9121	17.4926	17.8796	18.2665	(38)
Heat transfer coeff	68.0152	67.8217	67.6283	66.6608	66.4673	65.4999	65.4999	65.3064	65.8869	66.4673	66.8543	67.2413	(39)
Average = Sum(39)m / 12 =												66.6124	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8486	0.8462	0.8438	0.8317	0.8293	0.8172	0.8172	0.8148	0.8220	0.8293	0.8341	0.8389	(40)
HLP (average)												0.8311	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)
Hot water usage for mixer showers

65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day) 122.9552 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	

Distribution loss (46)m = 0.15 x (45)m

31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
									Total per year (kWh/year) = Sum(64)m =		2387.1855	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.7739	22.8921	18.6171	14.0944	10.5357	8.8947	9.6110	12.4928	16.7678	21.2906	24.8492	26.4902	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.9907	331.3942	322.8174	304.5586	281.5100	259.8476	245.3758	241.9722	250.5490	268.8079	291.8565	313.5189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains	550.0126	548.0918	530.5346	497.4399	464.5157	434.6094	416.7985	419.6273	436.4075	466.5157	503.0091	534.9386	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	19.6403	0.3100	0.0000	0.7700	86.4023	(76)

Solar gains	86.4023	169.0211	278.3537	405.9623	497.5221	509.3024	484.8766	416.5019	323.7369	200.5578	107.7335	71.0530	(83)
Total gains	636.4149	717.1129	808.8884	903.4023	962.0378	943.9118	901.6751	836.1292	760.1444	667.0735	610.7426	605.9916	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	90.6062	90.8647	91.1247	92.4471	92.7163	94.0857	94.0857	94.3644	93.5331	92.7163	92.1796	91.6491	
alpha	7.0404	7.0576	7.0750	7.1631	7.1811	7.2724	7.2724	7.2910	7.2355	7.1811	7.1453	7.1099	
util living area	0.9925	0.9817	0.9431	0.8225	0.6327	0.4434	0.3196	0.3592	0.5922	0.8928	0.9823	0.9944	(86)
MIT	20.3452	20.4960	20.7170	20.9172	20.9877	20.9992	20.9999	20.9999	20.9941	20.8753	20.5712	20.3144	(87)
Th 2	20.2114	20.2135	20.2156	20.2259	20.2280	20.2384	20.2384	20.2405	20.2343	20.2280	20.2239	20.2197	(88)
util rest of house	0.9901	0.9761	0.9274	0.7864	0.5837	0.3910	0.2643	0.2999	0.5291	0.8588	0.9759	0.9926	(89)
MIT 2	19.4579	19.6490	19.9197	20.1514	20.2192	20.2380	20.2384	20.2405	20.2310	20.1159	19.7538	19.4257	(90)
Living area fraction									fLA = Living area / (4) =			0.3281	(91)
MIT	19.7491	19.9269	20.1813	20.4027	20.4713	20.4878	20.4883	20.4897	20.4814	20.3651	20.0220	19.7173	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7491	19.9269	20.1813	20.4027	20.4713	20.4878	20.4883	20.4897	20.4814	20.3651	20.0220	19.7173	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9736	0.9266	0.7950	0.5994	0.4082	0.2824	0.3194	0.5497	0.8654	0.9739	0.9911	(94)
Useful gains	628.9297	698.2152	749.5282	718.2153	576.6044	385.3094	254.6646	267.0365	417.8414	577.2972	594.7747	600.5916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1050.7722	1019.1515	925.2424	766.7774	583.0079	385.6493	254.6832	267.0808	420.4499	649.0577	863.8922	1043.4013	(97)
Space heating kWh	313.8508	215.6692	130.7314	34.9648	4.7642	0.0000	0.0000	0.0000	0.0000	53.3898	193.7646	329.4504	(98a)
Space heating requirement - total per year (kWh/year)												1276.5852	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	313.8508	215.6692	130.7314	34.9648	4.7642	0.0000	0.0000	0.0000	0.0000	53.3898	193.7646	329.4504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1276.5852	
Space heating per m2											(98c) / (4) =	15.9275	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	313.8508	215.6692	130.7314	34.9648	4.7642	0.0000	0.0000	0.0000	0.0000	53.3898	193.7646	329.4504	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	313.8508	215.6692	130.7314	34.9648	4.7642	0.0000	0.0000	0.0000	0.0000	53.3898	193.7646	329.4504	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417	(231)
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1276.5852	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	660.0543	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	146.4912	(230a)
Total electricity for the above, kWh/year	146.4912	(231)
Electricity for lighting (calculated in Appendix L)	182.0700	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2265.2008	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1276.5852	16.4900	210.5089	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	16.4900	108.8430	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	146.4912	16.4900	24.1564	(249)
Energy for lighting	182.0700	16.4900	30.0234	(250)
Additional standing charges			0.0000	(251)
Total energy cost			373.5316	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0745	(257)
SAP value		82.5827	
SAP rating (Section 12)		83	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1276.5852	0.1579	201.5154	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			294.6913	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			341.2898	(272)
CO2 emissions per m2			4.2600	(273)
EI value			96.3458	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500	(1b) x	2.5500	(2b) =	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		204.3825	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	

Pressure Test Method												Blower Door	
Measured/design AP50												2.7000	(17)
Infiltration rate												0.1350	(18)
Number of sides sheltered												2	(19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.1148	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate													
	0.1234	0.1176	0.1176	0.1090	0.1119	0.0975	0.0975	0.0947	0.0975	0.1090	0.1061	0.1148	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2594	0.2536	0.2536	0.2450	0.2479	0.2335	0.2335	0.2307	0.2335	0.2450	0.2421	0.2508	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
Brickwork	47.5100	18.4300	29.0800	0.2100	6.1068	110.0000	3198.7998	(29a)
Communal Wall	16.7200	2.0600	14.6600	0.2200	3.2252	110.0000	1612.5999	(29a)
Stairwell Wall	20.3600		20.3600	0.2200	4.4792	110.0000	2239.6001	(29a)
Lift Shaft Wall	8.5400		8.5400	0.0000	0.0000	110.0000	939.4000	(29a)
Terrace Roof	5.7500		5.7500	0.1300	0.7475	9.0000	51.7500	(30)
Total net area of external elements Aum(A, m2)			90.3400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.8054			(33)
Main dwelling								
Party Wall 1			43.0200	0.0000	0.0000	110.0000	4732.2001	(32)
Party Floor 1			80.1500			70.0000	5610.5000	(32d)
Party Ceiling 1			74.4000			30.0000	2232.0000	(32b)
Internal Wall 1			174.2800			9.0000	1568.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 22185.3698	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	276.7981	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.2800	0.0380	1.7966
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	12.7200	0.0540	0.6869
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E25 Staggered party wall between dwellings	6.3600	0.0310	0.1972
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.4900	0.0160	0.2958
E15 Flat roof with parapet	6.8300	0.1500	1.0245
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.1693	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 48.9747	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.4926	17.1056	17.1056	16.5252	16.7187	15.7512	15.7512	15.5577	15.7512	16.5252	16.3317	16.9121	(38)
Heat transfer coeff	66.4673	66.0804	66.0804	65.4999	65.6934	64.7260	64.7260	64.5325	64.7260	65.4999	65.3064	65.8869	(39)
Average = Sum(39)m / 12 =												65.4354	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8293	0.8245	0.8245	0.8172	0.8196	0.8076	0.8076	0.8051	0.8076	0.8172	0.8148	0.8220	(40)
HLP (average)												0.8164	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4657	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)
Hot water usage for baths	28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)
Hot water usage for other uses	39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)
Average daily hot water use (litres/day)												122.9552	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)											Total = Sum(45)m =	2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
									Total per year (kWh/year) = Sum(64)m =			2387.1855	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.7739	22.8921	18.6171	14.0944	10.5357	8.8947	9.6110	12.4928	16.7678	21.2906	24.8492	26.4902	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.9907	331.3942	322.8174	304.5586	281.5100	259.8476	245.3758	241.9722	250.5490	268.8079	291.8565	313.5189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains	550.0126	548.0918	530.5346	497.4399	464.5157	434.6094	416.7985	419.6273	436.4075	466.5157	503.0091	534.9386	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	23.8018	0.3100	0.0000	0.7700	104.7097	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	104.7097	178.9135	291.9814	431.1994	513.9280	556.1357	524.3829	462.4564	361.6266	227.7362	128.6109	86.6042	(83)
Total gains	654.7223	727.0053	822.5161	928.6393	978.4437	990.7452	941.1814	882.0837	798.0341	694.2519	631.6201	621.5427	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	92.7163	93.2592	93.2592	94.0857	93.8086	95.2107	95.2107	95.4962	95.2107	94.0857	94.3644	93.5331	
alpha	7.1811	7.2173	7.2173	7.2724	7.2539	7.3474	7.3474	7.3664	7.3474	7.2724	7.2910	7.2355	
util living area	0.9875	0.9722	0.9135	0.7499	0.5408	0.3396	0.2269	0.2487	0.4854	0.8259	0.9676	0.9906	(86)
MIT	20.4654	20.6032	20.8078	20.9599	20.9962	20.9999	21.0000	21.0000	20.9987	20.9362	20.6893	20.4364	(87)
Th 2	20.2280	20.2322	20.2322	20.2384	20.2364	20.2468	20.2468	20.2489	20.2468	20.2384	20.2405	20.2343	(88)
util rest of house	0.9835	0.9637	0.8913	0.7078	0.4911	0.2905	0.1751	0.1938	0.4251	0.7799	0.9561	0.9874	(89)
MIT 2	19.6233	19.7976	20.0399	20.2051	20.2339	20.2467	20.2468	20.2489	20.2462	20.1866	19.9128	19.5923	(90)
Living area fraction										fLA = Living area / (4) =		0.3281	(91)
MIT	19.8996	20.0619	20.2919	20.4528	20.4840	20.4939	20.4939	20.4953	20.4931	20.4326	20.1676	19.8693	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8996	20.0619	20.2919	20.4528	20.4840	20.4939	20.4939	20.4953	20.4931	20.4326	20.1676	19.8693	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9814	0.9615	0.8931	0.7200	0.5073	0.3066	0.1921	0.2118	0.4449	0.7923	0.9548	0.9855	(94)
Useful gains	642.5172	699.0261	734.6298	668.6015	496.3862	303.7803	180.8396	186.8420	355.0266	550.0639	603.0672	612.5559	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	983.6927	949.0418	851.9011	691.2057	498.2218	303.8160	180.8404	186.8436	355.5459	585.0813	794.6200	973.1015	(97)
Space heating kWh	253.8346	168.0106	87.2499	16.2750	1.3657	0.0000	0.0000	0.0000	0.0000	26.0530	137.9180	268.2459	(98a)
Space heating requirement - total per year (kWh/year)												958.9526	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	253.8346	168.0106	87.2499	16.2750	1.3657	0.0000	0.0000	0.0000	0.0000	26.0530	137.9180	268.2459	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												958.9526	
Space heating per m2											(98c) / (4) =	11.9645	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	253.8346	168.0106	87.2499	16.2750	1.3657	0.0000	0.0000	0.0000	0.0000	26.0530	137.9180	268.2459	(98)

Space heating efficiency (main heating system 1)

100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)

253.8346	168.0106	87.2499	16.2750	1.3657	0.0000	0.0000	0.0000	0.0000	26.0530	137.9180	268.2459	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)

Efficiency of water heater 361.6650 (216)

(217)m 361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)

Fuel for water heating, kWh/month

66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417	(231)
Lighting 22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 958.9526 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 660.0543 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 146.4912 (230a)
Total electricity for the above, kWh/year 146.4912 (231)
Electricity for lighting (calculated in Appendix L) 182.0700 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1947.5681 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	958.9526	27.6700	265.3422	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	27.6700	182.6370	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	146.4912	27.6700	40.5341	(249)
Energy for lighting	182.0700	27.6700	50.3788	(250)
Additional standing charges			0.0000	(251)
Total energy cost			538.8921	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	958.9526	0.1587	152.2065	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			245.3824	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			291.9809	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	958.9526	1.5875	1522.3495	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	1.5220	1004.5938	(278)
Space and water heating			2526.9434	(279)
Pumps, fans and electric keep-hot	146.4912	1.5128	221.6118	(281)
Energy for lighting	182.0700	1.5338	279.2651	(282)
Total Primary energy kWh/year			3027.8203	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating:	B 83
Current environmental impact rating:	A 96

N	Solar water heating		Not applicable
U	Solar photovoltaic panels		Not applicable
V2	Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	B 83
Potential environmental impact rating:	A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£539	£539	£0
Space heating	£306	£306	£0
Water heating	£183	£183	£0
Lighting	£50	£50	£0
Total cost of fuels	£539	£539	£0
Total cost of uses	£539	£539	£0
Delivered energy	24 kWh/m²	24 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	38 kWh/m²	38 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500 (1b)	x	2.5500 (2b)	=	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	204.3825	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7000 (17)
Infiltration rate		0.1350 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1148 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1463	0.1434	0.1406	0.1262	0.1234	0.1090	0.1090	0.1061	0.1148	0.1234	0.1291	0.1348	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2823	0.2794	0.2766	0.2622	0.2594	0.2450	0.2450	0.2421	0.2508	0.2594	0.2651	0.2708	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
Brickwork	47.5100	18.4300	29.0800	0.2100	6.1068	110.0000	3198.7998	(29a)
Communal Wall	16.7200	2.0600	14.6600	0.2200	3.2252	110.0000	1612.5999	(29a)
Stairwell Wall	20.3600		20.3600	0.2200	4.4792	110.0000	2239.6001	(29a)
Lift Shaft Wall	8.5400		8.5400	0.0000	0.0000	110.0000	939.4000	(29a)
Terrace Roof	5.7500		5.7500	0.1300	0.7475	9.0000	51.7500	(30)
Total net area of external elements Aum(A, m2)			90.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.8054			(33)
Main dwelling								
Party Wall 1			43.0200	0.0000	0.0000	110.0000	4732.2001	(32)
Party Floor 1			80.1500			70.0000	5610.5000	(32d)
Party Ceiling 1			74.4000			30.0000	2232.0000	(32b)
Internal Wall 1			174.2800			9.0000	1568.5200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22185.3698 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.7981 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.2800	0.0380	1.7966
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	12.7200	0.0540	0.6869
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E25 Staggered party wall between dwellings	6.3600	0.0310	0.1972
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.4900	0.0160	0.2958
E15 Flat roof with parapet	6.8300	0.1500	1.0245
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1693 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.9747 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.0405	18.8470	18.6535	17.6861	17.4926	16.5252	16.5252	16.3317	16.9121	17.4926	17.8796	18.2665	(38)
Heat transfer coeff	68.0152	67.8217	67.6283	66.6608	66.4673	65.4999	65.4999	65.3064	65.8869	66.4673	66.8543	67.2413	(39)
Average = Sum(39)m / 12 =												66.6124	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8486	0.8462	0.8438	0.8317	0.8293	0.8172	0.8172	0.8148	0.8220	0.8293	0.8341	0.8389	(40)
HLP (average)												0.8311	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4657 (42)
Hot water usage for mixer showers

65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)

Hot water usage for baths

28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)

Hot water usage for other uses

39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)

Average daily hot water use (litres/day) 122.9552 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
										Total per year (kWh/year) = Sum(64)m =		2387.1855	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.7739	22.8921	18.6171	14.0944	10.5357	8.8947	9.6110	12.4928	16.7678	21.2906	24.8492	26.4902	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.9907	331.3942	322.8174	304.5586	281.5100	259.8476	245.3758	241.9722	250.5490	268.8079	291.8565	313.5189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)													
	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains													
	550.0126	548.0918	530.5346	497.4399	464.5157	434.6094	416.7985	419.6273	436.4075	466.5157	503.0091	534.9386	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	19.6403	0.3100	0.0000	0.7700	86.4023	(76)

Solar gains	86.4023	169.0211	278.3537	405.9623	497.5221	509.3024	484.8766	416.5019	323.7369	200.5578	107.7335	71.0530	(83)
Total gains	636.4149	717.1129	808.8884	903.4023	962.0378	943.9118	901.6751	836.1292	760.1444	667.0735	610.7426	605.9916	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	90.6062	90.8647	91.1247	92.4471	92.7163	94.0857	94.0857	94.3644	93.5331	92.7163	92.1796	91.6491	
alpha	7.0404	7.0576	7.0750	7.1631	7.1811	7.2724	7.2724	7.2910	7.2355	7.1811	7.1453	7.1099	
util living area													
	0.9925	0.9817	0.9431	0.8225	0.6327	0.4434	0.3196	0.3592	0.5922	0.8928	0.9823	0.9944	(86)
MIT	20.3452	20.4960	20.7170	20.9172	20.9877	20.9992	20.9999	20.9999	20.9941	20.8753	20.5712	20.3144	(87)
Th 2	20.2114	20.2135	20.2156	20.2259	20.2280	20.2384	20.2384	20.2405	20.2343	20.2280	20.2239	20.2197	(88)
util rest of house													
	0.9901	0.9761	0.9274	0.7864	0.5837	0.3910	0.2643	0.2999	0.5291	0.8588	0.9759	0.9926	(89)
MIT 2	19.4579	19.6490	19.9197	20.1514	20.2192	20.2380	20.2384	20.2405	20.2310	20.1159	19.7538	19.4257	(90)
Living area fraction										fLA = Living area / (4) =		0.3281	(91)
MIT	19.7491	19.9269	20.1813	20.4027	20.4713	20.4878	20.4883	20.4897	20.4814	20.3651	20.0220	19.7173	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7491	19.9269	20.1813	20.4027	20.4713	20.4878	20.4883	20.4897	20.4814	20.3651	20.0220	19.7173	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9736	0.9266	0.7950	0.5994	0.4082	0.2824	0.3194	0.5497	0.8654	0.9739	0.9911	(94)
Useful gains	628.9297	698.2152	749.5282	718.2153	576.6044	385.3094	254.6646	267.0365	417.8414	577.2972	594.7747	600.5916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1050.7722	1019.1515	925.2424	766.7774	583.0079	385.6493	254.6832	267.0808	420.4499	649.0577	863.8922	1043.4013	(97)
Space heating kWh													
	313.8508	215.6692	130.7314	34.9648	4.7642	0.0000	0.0000	0.0000	0.0000	53.3898	193.7646	329.4504	(98a)
Space heating requirement - total per year (kWh/year)												1276.5852	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	313.8508	215.6692	130.7314	34.9648	4.7642	0.0000	0.0000	0.0000	0.0000	53.3898	193.7646	329.4504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1276.5852	
Space heating per m2											(98c) / (4) =	15.9275	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	313.8508	215.6692	130.7314	34.9648	4.7642	0.0000	0.0000	0.0000	0.0000	53.3898	193.7646	329.4504	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	313.8508	215.6692	130.7314	34.9648	4.7642	0.0000	0.0000	0.0000	0.0000	53.3898	193.7646	329.4504	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)

Fuel for water heating, kWh/month

	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417 (231)
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1276.5852	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	660.0543	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	146.4912	(230a)
Total electricity for the above, kWh/year	146.4912	(231)
Electricity for lighting (calculated in Appendix L)	182.0700	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2265.2008	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1276.5852	16.4900	210.5089	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	16.4900	108.8430	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	146.4912	16.4900	24.1564	(249)
Energy for lighting	182.0700	16.4900	30.0234	(250)
Additional standing charges			0.0000	(251)
Total energy cost			373.5316	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0745	(257)
SAP value		82.5827	
SAP rating (Section 12)		83	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1276.5852	0.1579	201.5154	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			294.6913	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			341.2898	(272)
CO2 emissions per m2			4.2600	(273)
EI value			96.3458	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	80.1500 (1b)	x	2.5500 (2b)	=	204.3825	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	204.3825	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7000 (17)
Infiltration rate		0.1350 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1148 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1234	0.1176	0.1176	0.1090	0.1119	0.0975	0.0975	0.0947	0.0975	0.1090	0.1061	0.1148	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2594	0.2536	0.2536	0.2450	0.2479	0.2335	0.2335	0.2307	0.2335	0.2450	0.2421	0.2508	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			18.4300	1.2357	22.7747			(27)
Brickwork	47.5100	18.4300	29.0800	0.2100	6.1068	110.0000	3198.7998	(29a)
Communal Wall	16.7200	2.0600	14.6600	0.2200	3.2252	110.0000	1612.5999	(29a)
Stairwell Wall	20.3600		20.3600	0.2200	4.4792	110.0000	2239.6001	(29a)
Lift Shaft Wall	8.5400		8.5400	0.0000	0.0000	110.0000	939.4000	(29a)
Terrace Roof	5.7500		5.7500	0.1300	0.7475	9.0000	51.7500	(30)
Total net area of external elements Aum(A, m2)			90.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.8054			(33)
Main dwelling								
Party Wall 1			43.0200	0.0000	0.0000	110.0000	4732.2001	(32)
Party Floor 1			80.1500			70.0000	5610.5000	(32d)
Party Ceiling 1			74.4000			30.0000	2232.0000	(32b)
Internal Wall 1			174.2800			9.0000	1568.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 22185.3698 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	276.7981 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.2800	0.0380	1.7966
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.0600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.1000	0.3300	2.6730
E16 Corner (normal)	12.7200	0.0540	0.6869
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E25 Staggered party wall between dwellings	6.3600	0.0310	0.1972
E2 Other lintels (including other steel lintels)	8.7000	0.0500	0.4350
E4 Jamb	18.4900	0.0160	0.2958
E15 Flat roof with parapet	6.8300	0.1500	1.0245
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.1693 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 48.9747 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.4926	17.1056	17.1056	16.5252	16.7187	15.7512	15.7512	15.5577	15.7512	16.5252	16.3317	16.9121	(38)
Heat transfer coeff	66.4673	66.0804	66.0804	65.4999	65.6934	64.7260	64.7260	64.5325	64.7260	65.4999	65.3064	65.8869	(39)
Average = Sum(39)m / 12 =												65.4354	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8293	0.8245	0.8245	0.8172	0.8196	0.8076	0.8076	0.8051	0.8076	0.8172	0.8148	0.8220	(40)
HLP (average)												0.8164	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4657 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5614	64.5761	63.1404	60.3934	58.3662	56.1055	54.8205	56.2454	57.8073	60.2346	63.0406	65.3102	(42a)

Hot water usage for baths

	28.3168	27.8962	27.3040	26.2121	25.3945	24.4878	23.9981	24.5862	25.2265	26.1966	27.3110	28.2210	(42b)
Hot water usage for other uses	39.8812	38.4310	36.9808	35.5306	34.0803	32.6301	32.6301	34.0803	35.5306	36.9808	38.4310	39.8812	(42c)
Average daily hot water use (litres/day)												122.9552	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.7594	130.9034	127.4252	122.1361	117.8410	113.2235	111.4488	114.9119	118.5643	123.4120	128.7826	133.4125	(44)
Energy conte	211.8422	186.4047	195.8478	167.1982	158.6367	139.2214	134.7876	142.2849	146.2017	167.4689	183.4745	208.8917	(45)
Energy content (annual)										Total = Sum(45)m =		2042.2605	
Distribution loss (46)m = 0.15 x (45)m	31.7763	27.9607	29.3772	25.0797	23.7955	20.8832	20.2181	21.3427	21.9303	25.1203	27.5212	31.3338	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
								Total per year (kWh/year) = Sum(64)m =				2387.1855	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							0.0000	(64a)
Heat gains from water heating, kWh/month	70.4375	61.9796	65.1194	55.5934	52.7467	46.2911	44.8169	47.3097	48.6121	55.6834	61.0053	69.4565	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	147.9421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.7739	22.8921	18.6171	14.0944	10.5357	8.8947	9.6110	12.4928	16.7678	21.2906	24.8492	26.4902	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.9907	331.3942	322.8174	304.5586	281.5100	259.8476	245.3758	241.9722	250.5490	268.8079	291.8565	313.5189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	52.2599	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	-98.6280	(71)
Water heating gains (Table 5)	94.6741	92.2315	87.5261	77.2131	70.8961	64.2932	60.2377	63.5884	67.5167	74.8433	84.7295	93.3555	(72)
Total internal gains	550.0126	548.0918	530.5346	497.4399	464.5157	434.6094	416.7985	419.6273	436.4075	466.5157	503.0091	534.9386	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	18.4300	23.8018	0.3100	0.0000	0.7700	104.7097	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	104.7097	178.9135	291.9814	431.1994	513.9280	556.1357	524.3829	462.4564	361.6266	227.7362	128.6109	86.6042	(83)
Total gains	654.7223	727.0053	822.5161	928.6393	978.4437	990.7452	941.1814	882.0837	798.0341	694.2519	631.6201	621.5427	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	92.7163	93.2592	93.2592	94.0857	93.8086	95.2107	95.2107	95.4962	95.2107	94.0857	94.3644	93.5331	
alpha	7.1811	7.2173	7.2173	7.2724	7.2539	7.3474	7.3474	7.3664	7.3474	7.2724	7.2910	7.2355	
util living area	0.9875	0.9722	0.9135	0.7499	0.5408	0.3396	0.2269	0.2487	0.4854	0.8259	0.9676	0.9906	(86)
MIT	20.4654	20.6032	20.8078	20.9599	20.9962	20.9999	21.0000	21.0000	20.9987	20.9362	20.6893	20.4364	(87)
Th 2	20.2280	20.2322	20.2322	20.2384	20.2364	20.2468	20.2468	20.2489	20.2468	20.2384	20.2405	20.2343	(88)
util rest of house	0.9835	0.9637	0.8913	0.7078	0.4911	0.2905	0.1751	0.1938	0.4251	0.7799	0.9561	0.9874	(89)
MIT 2	19.6233	19.7976	20.0399	20.2051	20.2339	20.2467	20.2468	20.2489	20.2462	20.1866	19.9128	19.5923	(90)
Living area fraction									fLA = Living area / (4) =			0.3281	(91)
MIT	19.8996	20.0619	20.2919	20.4528	20.4840	20.4939	20.4939	20.4953	20.4931	20.4326	20.1676	19.8693	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8996	20.0619	20.2919	20.4528	20.4840	20.4939	20.4939	20.4953	20.4931	20.4326	20.1676	19.8693	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9814	0.9615	0.8931	0.7200	0.5073	0.3066	0.1921	0.2118	0.4449	0.7923	0.9548	0.9855	(94)
Useful gains	642.5172	699.0261	734.6298	668.6015	496.3862	303.7803	180.8396	186.8420	355.0266	550.0639	603.0672	612.5559	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	983.6927	949.0418	851.9011	691.2057	498.2218	303.8160	180.8404	186.8436	355.5459	585.0813	794.6200	973.1015	(97)

Space heating kWh

	253.8346	168.0106	87.2499	16.2750	1.3657	0.0000	0.0000	0.0000	0.0000	26.0530	137.9180	268.2459 (98a)
Space heating requirement - total per year (kWh/year)												958.9526
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	253.8346	168.0106	87.2499	16.2750	1.3657	0.0000	0.0000	0.0000	0.0000	26.0530	137.9180	268.2459 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												958.9526
Space heating per m2											(98c) / (4) =	11.9645 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	253.8346	168.0106	87.2499	16.2750	1.3657	0.0000	0.0000	0.0000	0.0000	26.0530	137.9180	268.2459	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	253.8346	168.0106	87.2499	16.2750	1.3657	0.0000	0.0000	0.0000	0.0000	26.0530	137.9180	268.2459	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	241.1372	212.8647	225.1428	195.5482	187.9317	167.5714	164.0826	171.5799	174.5517	196.7639	211.8245	238.1867	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	66.6742	58.8569	62.2518	54.0689	51.9629	46.3333	45.3687	47.4417	48.2634	54.4050	58.5693	65.8584	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	12.4417	11.2377	12.4417	12.0404	12.4417	12.0404	12.4417	12.4417	12.0404	12.4417	12.0404	12.4417	(231)
Lighting	22.5597	18.0983	16.2955	11.9388	9.2218	7.5343	8.4125	10.9349	14.2033	18.6355	21.0487	23.1867	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												958.9526	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												660.0543	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												146.4912	(230a)
Total electricity for the above, kWh/year												146.4912	(231)
Electricity for lighting (calculated in Appendix L)												182.0700	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1947.5681	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	958.9526	27.6700	265.3422	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	27.6700	182.6370	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	146.4912	27.6700	40.5341	(249)
Energy for lighting	182.0700	27.6700	50.3788	(250)
Additional standing charges			0.0000	(251)
Total energy cost			538.8921	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	958.9526	0.1587	152.2065	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	660.0543	0.1412	93.1759	(264)
Space and water heating			245.3824	(265)
Pumps, fans and electric keep-hot	146.4912	0.1387	20.3201	(267)
Energy for lighting	182.0700	0.1443	26.2783	(268)
Total CO2, kg/year			291.9809	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	958.9526	1.5875	1522.3495	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	660.0543	1.5220	1004.5938	(278)
Space and water heating			2526.9434	(279)
Pumps, fans and electric keep-hot	146.4912	1.5128	221.6118	(281)
Energy for lighting	182.0700	1.5338	279.2651	(282)
Total Primary energy kWh/year			3027.8203	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-27	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-27
Plot Address	Flat 7, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	80 C	**DER**	4.82	**TER**	12.75
Environmental	96 A	**% DER < TER**			62.20
CO_2 Emissions (t/year)	0.39	**DFEE**	37.39	**TFEE**	41.22
Compliance Check	See BREL	**% DFEE < TFEE**			9.28
% DPER < TPER	26.37	**DPER**	49.59	**TPER**	67.35

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	247.82	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	34.13 m	100.12 m²	2.55 m

8.0 Living Area	30.26	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	94.21	70.55	0.00	None	23.66	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	7.28	5.13	0.50	Stairwell Access Corridor 1	2.15	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	8.51	8.51	0.00	None	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	42.58	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	215.32

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Terrace Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	51.60	51.60	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	48.52

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	100.12

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	North	2.15	
Patio Door	Window-Red	Brickwork	South East	5.42	
East	Window-Red	Brickwork	East	4.91	
West	Window	Brickwork	West	4.34	
South East	Window-Red	Brickwork	South East	6.80	
South East	Window-Red	Brickwork	South East	2.18	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	31.89	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	16.11	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	6.45	-0.10	-0.10	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	26.42	0.00	0.00		No
E2 Other lintels (including other steel lintels)	Independently assessed	10.88	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	37.80	0.02	0.02	RCD	Yes
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.51	0.33	0.33	Abbey Calculated	No
E15 Flat roof with parapet	Independently assessed	27.32	0.15	0.15		No
E25 Staggered party wall between dwellings	Gov Approved Scheme	12.89	0.03	0.03	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value	0.07	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	2
Manufacturer SFP	0.49
Duct Type	Rigid
MVHR Efficiency	90.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.59	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	9
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No

Summary for Input Data

Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-27	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-27
Plot Address	Flat 7, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	80 C	**DER**	4.82	**TER**	12.75
Environmental	96 A	**% DER < TER**			62.20
CO_2 Emissions (t/year)	0.39	**DFEE**	37.39	**TFEE**	41.22
Compliance Check	See BREL	**% DFEE < TFEE**			9.28
% DPER < TPER	26.37	**DPER**	49.59	**TPER**	67.35

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.1200	(1b)	x 2.5500	(2b) =	255.3060	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.1200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	255.3060	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5900	(17)
Infiltration rate		0.1295	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1101	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1403	0.1376	0.1348	0.1211	0.1183	0.1046	0.1046	0.1018	0.1101	0.1183	0.1238	0.1293	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2803	0.2776	0.2748	0.2611	0.2583	0.2446	0.2446	0.2418	0.2501	0.2583	0.2638	0.2693	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			19.3100	1.2357	23.8622			(27)
Brickwork	94.2100	23.6500	70.5600	0.2100	14.8176	110.0000	7761.5999	(29a)
Communal Wall	7.2800	2.1500	5.1300	0.2200	1.1286	110.0000	564.3000	(29a)
Stairwell Wall	8.5100		8.5100	0.2500	2.1275	110.0000	936.1000	(29a)
Terrace Roof	51.6000		51.6000	0.1300	6.7080	9.0000	464.4000	(30)
Total net area of external elements Aum(A, m2)			161.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1933			(33)
Main dwelling								
Party Wall 1			42.5800	0.0000	0.0000	110.0000	4683.8002	(32)
Party Floor 1			100.1200			70.0000	7008.4000	(32d)
Party Ceiling 1			48.5200			30.0000	1455.6000	(32b)
Internal Wall 1			215.3200			9.0000	1937.8801	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24812.0802 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 247.8234 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	31.8900	0.0380	1.2118
E16 Corner (normal)	16.1150	0.0540	0.8702
E17 Corner (inverted - internal area greater than external area)	6.4460	-0.0970	-0.6253
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.4200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.8800	0.0500	0.5440
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.5100	0.3300	1.4883
E15 Flat roof with parapet	27.3200	0.1500	4.0980
E25 Staggered party wall between dwellings	12.8900	0.0310	0.3996
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.3355 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 67.5288 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.6194	23.3875	23.1557	21.9965	21.7646	20.6054	20.6054	20.3735	21.0691	21.7646	22.2283	22.6920	(38)
Heat transfer coeff	91.1482	90.9163	90.6845	89.5252	89.2934	88.1342	88.1342	87.9023	88.5979	89.2934	89.7571	90.2208	(39)
Average = Sum(39)m / 12 =												89.4673	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9104	0.9081	0.9058	0.8942	0.8919	0.8803	0.8803	0.8780	0.8849	0.8919	0.8965	0.9011	(40)
HLP (average)												0.8936	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7406 (42)
Hot water usage for mixer showers

70.1712	69.1167	67.5800	64.6399	62.4701	60.0504	58.6751	60.2001	61.8719	64.4699	67.4731	69.9024	(42a)

Hot water usage for baths

30.2991	29.8492	29.2155	28.0471	27.1722	26.2021	25.6781	26.3074	26.9925	28.0305	29.2230	30.1967	(42b)

Hot water usage for other uses

42.6968	41.1442	39.5916	38.0390	36.4864	34.9338	34.9338	36.4864	38.0390	39.5916	41.1442	42.6968	(42c)

Average daily hot water use (litres/day) 131.6029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1672	140.1100	136.3871	130.7260	126.1287	121.1864	119.2870	122.9939	126.9034	132.0920	137.8404	142.7959	(44)
Energy conte	226.7418	199.5148	209.6219	178.9573	169.7935	149.0128	144.2673	152.2922	156.4845	179.2476	196.3789	223.5839	(45)
Energy content (annual)										Total = Sum(45)m =		2185.8965	
Distribution loss (46)m = 0.15 x (45)m	34.0113	29.9272	31.4433	26.8436	25.4690	22.3519	21.6401	22.8438	23.4727	26.8871	29.4568	33.5376	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)
									Total per year (kWh/year) = Sum(64)m =		2530.8215	(64)
12Total per year (kWh/year)											2531	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

75.3917	66.3387	69.6993	59.5033	56.4563	49.5467	47.9689	50.6371	52.0311	59.5998	65.2960	74.3416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.3857	143.2485	129.3857	133.6986	129.3857	133.6986	129.3857	129.3857	133.6986	129.3857	133.6986	129.3857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.5216	259.1835	252.4756	238.1954	220.1691	203.2269	191.9085	189.2466	195.9545	210.2347	228.2610	245.2032	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	(71)
Water heating gains (Table 5)	101.3329	98.7183	93.6818	82.6435	75.8822	68.8149	64.4743	68.0607	72.2654	80.1073	90.6888	99.9216	(72)
Total internal gains	551.3497	565.2598	539.6527	518.6469	489.5465	469.8499	449.8780	450.8025	466.0280	483.8373	516.7579	538.6200	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	19.6403	0.3300	0.0000	0.7700	21.6592	(80)

East			4.9100		19.6403		0.3100		0.0000		0.7700		23.0187 (76)
Southeast			14.4000		36.7938		0.3100		0.0000		0.7700		126.4707 (77)
Solar gains	171.1486	302.8258	438.6902	575.1365	666.3377	669.4710	642.2638	574.1889	486.5599	341.7988	207.1908	144.9735	(83)
Total gains	722.4983	868.0856	978.3429	1093.7834	1155.8842	1139.3209	1092.1418	1024.9914	952.5878	825.6361	723.9488	683.5935	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6158	75.8086	76.0025	76.9866	77.1865	78.2017	78.2017	78.4080	77.7925	77.1865	76.7877	76.3931	
alpha	6.0411	6.0539	6.0668	6.1324	6.1458	6.2134	6.2134	6.2272	6.1862	6.1458	6.1192	6.0929	
util living area	0.9941	0.9823	0.9514	0.8556	0.6892	0.4919	0.3547	0.3938	0.6263	0.9052	0.9847	0.9957	(86)
MIT	20.0935	20.3107	20.5665	20.8333	20.9617	20.9959	20.9995	20.9992	20.9834	20.7949	20.3953	20.0567	(87)
Th 2	20.1587	20.1606	20.1626	20.1725	20.1744	20.1843	20.1843	20.1863	20.1803	20.1744	20.1705	20.1665	(88)
util rest of house	0.9924	0.9773	0.9382	0.8229	0.6371	0.4306	0.2892	0.3245	0.5582	0.8746	0.9794	0.9944	(89)
MIT 2	19.1045	19.3802	19.6975	20.0141	20.1449	20.1821	20.1841	20.1860	20.1702	19.9815	19.4971	19.0638	(90)
Living area fraction									fLA = Living area / (4) =			0.3022	(91)
MIT	19.4034	19.6615	19.9601	20.2617	20.3918	20.4280	20.4306	20.4317	20.4159	20.2274	19.7686	19.3638	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4034	19.6615	19.9601	20.2617	20.3918	20.4280	20.4306	20.4317	20.4159	20.2274	19.7686	19.3638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9902	0.9735	0.9344	0.8267	0.6512	0.4491	0.3090	0.3455	0.5782	0.8768	0.9761	0.9926	(94)
Useful gains	715.4361	845.0887	914.1782	904.2618	752.7100	511.6445	337.4472	354.0882	550.7946	723.9239	706.6536	678.5661	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1376.6492	1342.0578	1220.6243	1017.1599	776.1185	513.6491	337.6056	354.3995	559.5783	859.6589	1137.0926	1368.0942	(97)
Space heating kWh	491.9426	333.9632	227.9959	81.2866	17.4159	0.0000	0.0000	0.0000	0.0000	100.9869	309.9161	513.0089	(98a)
Space heating requirement - total per year (kWh/year)												2076.5160	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	491.9426	333.9632	227.9959	81.2866	17.4159	0.0000	0.0000	0.0000	0.0000	100.9869	309.9161	513.0089	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2076.5160	
Space heating per m2											(98c) / (4) =	20.7403	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	491.9426	333.9632	227.9959	81.2866	17.4159	0.0000	0.0000	0.0000	0.0000	100.9869	309.9161	513.0089	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	491.9426	333.9632	227.9959	81.2866	17.4159	0.0000	0.0000	0.0000	0.0000	100.9869	309.9161	513.0089	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	70.7939	62.4818	66.0603	57.3203	55.0478	49.0406	47.9898	50.2087	51.1066	57.6618	62.1373	69.9207	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.2030	14.6350	16.2030	15.6803	16.2030	15.6803	16.2030	16.2030	15.6803	16.2030	15.6803	16.2030	(231)
Lighting	26.3343	21.1264	19.0219	13.9363	10.7648	8.7949	9.8200	12.7644	16.5797	21.7535	24.5705	27.0662	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2076.5160	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	699.7695	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	190.7774	(230a)
Total electricity for the above, kWh/year	190.7774	(231)
Electricity for lighting (calculated in Appendix L)	212.5329	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3179.5959	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2076.5160	0.1573	326.5790	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	699.7695	0.1412	98.7988	(264)
Space and water heating			425.3778	(265)
Pumps, fans and electric keep-hot	190.7774	0.1387	26.4632	(267)
Energy for lighting	212.5329	0.1443	30.6751	(268)
Total CO2, kg/year			482.5160	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2076.5160	1.5822	3285.4587	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	699.7695	1.5221	1065.1015	(278)
Space and water heating			4350.5602	(279)
Pumps, fans and electric keep-hot	190.7774	1.5128	288.6081	(281)
Energy for lighting	212.5329	1.5338	325.9901	(282)
Total Primary energy kWh/year			4965.1583	(286)
Dwelling Primary energy Rate (DPER)			49.5900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.1200	(1b) x	2.5500	(2b) =	255.3060	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.1200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		255.3060	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1567	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4067	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3457	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4407	0.4321	0.4235	0.3802	0.3716	0.3284	0.3284	0.3197	0.3457	0.3716	0.3889	0.4062	(22b)
Effective ac	0.5971	0.5934	0.5897	0.5723	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5756	0.5825	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.8800	1.1450	26.1985			(27)
Brickwork	94.2100	22.8800	71.3300	0.1800	12.8394			(29a)
Communal Wall	7.2800	2.1500	5.1300	0.1800	0.9234			(29a)
Stairwell Wall	8.5100		8.5100	0.1800	1.5318			(29a)
Terrace Roof	51.6000		51.6000	0.1100	5.6760			(30)
Total net area of external elements Aum(A, m2)			161.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.3191			(33)
Main dwelling								
Party Wall 1			42.5800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	247.8234	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	31.8900	0.0700	2.2323
E16 Corner (normal)	16.1150	0.0900	1.4503
E17 Corner (inverted - internal area greater than external area)	6.4460	-0.0900	-0.5801
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.4200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.8800	0.0500	0.5440
E4 Jamb	37.8000	0.0500	1.8900
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.5100	0.0200	0.0902
E15 Flat roof with parapet	27.3200	0.5600	15.2992
E25 Staggered party wall between dwellings	12.8900	0.0600	0.7734
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		25.6193	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	74.9384	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	50.3082	49.9905	49.6790	48.2161	47.9424	46.6683	46.6683	46.4323	47.1591	47.9424	48.4961	49.0750	(38)
Heat transfer coeff													
	125.2466	124.9288	124.6174	123.1545	122.8808	121.6067	121.6067	121.3707	122.0975	122.8808	123.4345	124.0134	(39)
Average = Sum(39)m / 12 =												123.1532	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2510	1.2478	1.2447	1.2301	1.2273	1.2146	1.2146	1.2123	1.2195	1.2273	1.2329	1.2386	(40)
HLP (average)												1.2301	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7406	(42)

Hot water usage for mixer showers

	70.1712	69.1167	67.5800	64.6399	62.4701	60.0504	58.6751	60.2001	61.8719	64.4699	67.4731	69.9024	(42a)

Hot water usage for baths

	30.2991	29.8492	29.2155	28.0471	27.1722	26.2021	25.6781	26.3074	26.9925	28.0305	29.2230	30.1967	(42b)

Hot water usage for other uses

	42.6968	41.1442	39.5916	38.0390	36.4864	34.9338	34.9338	36.4864	38.0390	39.5916	41.1442	42.6968	(42c)

Average daily hot water use (litres/day)	131.6029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.1672	140.1100	136.3871	130.7260	126.1287	121.1864	119.2870	122.9939	126.9034	132.0920	137.8404	142.7959	(44)
Energy conte	226.7418	199.5148	209.6219	178.9573	169.7935	149.0128	144.2673	152.2922	156.4845	179.2476	196.3789	223.5839	(45)
Energy content (annual)										Total = Sum(45)m =		2185.8965	
Distribution loss (46)m = 0.15 x (45)m													
	34.0113	29.9272	31.4433	26.8436	25.4690	22.3519	21.6401	22.8438	23.4727	26.8871	29.4568	33.5376	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.3367	241.6006	256.2168	224.0492	216.3884	194.1046	190.8622	198.8871	201.5764	225.8425	241.4707	270.1788	(62)
WWHRS	-32.0793	-28.3712	-29.7087	-24.6000	-22.9263	-19.6182	-18.3889	-19.5548	-20.2978	-23.9288	-27.1084	-31.4853	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	241.2574	213.2293	226.5081	199.4492	193.4621	174.4864	172.4733	179.3323	181.2786	201.9137	214.3623	238.6935	(64)
										Total per year (kWh/year) = Sum(64)m =		2436.4460	(64)
12Total per year (kWh/year)												2436	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	112.6676	100.0073	106.9752	95.5768	93.7323	85.6202	85.2448	87.9131	88.1046	96.8758	101.3694	111.6176	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.3857	143.2485	129.3857	133.6986	129.3857	133.6986	129.3857	129.3857	133.6986	129.3857	133.6986	129.3857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.5216	259.1835	252.4756	238.1954	220.1691	203.2269	191.9085	189.2466	195.9545	210.2347	228.2610	245.2032	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	(71)
Water heating gains (Table 5)													
	151.4349	148.8203	143.7839	132.7455	125.9842	118.9170	114.5763	118.1627	122.3675	130.2093	140.7909	150.0236	(72)
Total internal gains													
	604.4518	618.3618	592.7547	571.7489	542.6485	519.9519	499.9800	500.9045	516.1300	536.9393	569.8600	591.7220	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.7500	19.6403	0.6300	0.7000	0.7700	28.5110	(76)
Southeast	13.9300	36.7938	0.6300	0.7000	0.7700	156.6383	(77)
West	4.2000	19.6403	0.6300	0.7000	0.7700	25.2097	(80)

Solar gains	210.3591	371.9022	538.1321	704.7413	815.9864	819.6470	786.4064	703.3708	596.5724	419.5824	254.6001	178.2271	(83)
Total gains	814.8108	990.2640	1130.8868	1276.4902	1358.6349	1339.5989	1286.3864	1204.2753	1112.7024	956.5217	824.4601	769.9491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0294	55.1694	55.3072	55.9642	56.0889	56.6765	56.6765	56.7867	56.4487	56.0889	55.8373	55.5766	
alpha	4.6686	4.6780	4.6871	4.7309	4.7393	4.7784	4.7784	4.7858	4.7632	4.7393	4.7225	4.7051	
util living area													
	0.9925	0.9812	0.9553	0.8828	0.7476	0.5620	0.4123	0.4572	0.6960	0.9214	0.9834	0.9942	(86)
MIT	19.6420	19.8988	20.2300	20.6140	20.8650	20.9729	20.9949	20.9918	20.9275	20.5784	20.0390	19.6018	(87)
Th 2	19.8794	19.8820	19.8844	19.8960	19.8982	19.9083	19.9083	19.9102	19.9044	19.8982	19.8938	19.8892	(88)
util rest of house													
	0.9901	0.9754	0.9415	0.8490	0.6849	0.4741	0.3119	0.3522	0.6078	0.8903	0.9772	0.9923	(89)
MIT 2	18.3248	18.6509	19.0642	19.5272	19.7933	19.8942	19.9069	19.9076	19.8601	19.5013	18.8398	18.2806	(90)
Living area fraction									fLA = Living area / (4) =			0.3022	(91)
MIT	18.7229	19.0281	19.4165	19.8557	20.1172	20.2202	20.2357	20.2353	20.1827	19.8268	19.2022	18.6799	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7229	19.0281	19.4165	19.8557	20.1172	20.2202	20.2357	20.2353	20.1827	19.8268	19.2022	18.6799	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9695	0.9343	0.8476	0.6982	0.5000	0.3423	0.3840	0.6316	0.8879	0.9720	0.9893	(94)
Useful gains	803.8174	960.0194	1056.6073	1081.9181	948.6084	669.7389	440.3610	462.4600	702.8029	849.2986	801.3801	761.7013	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1806.4225	1765.0076	1609.6227	1349.2410	1034.3086	683.4522	442.1278	465.4928	742.6877	1133.7999	1493.8303	1795.7036	(97)
Space heating kWh													
	745.9381	540.9521	411.4434	192.4725	63.7609	0.0000	0.0000	0.0000	0.0000	211.6690	498.5641	769.2977	(98a)
Space heating requirement - total per year (kWh/year)												3434.0979	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	745.9381	540.9521	411.4434	192.4725	63.7609	0.0000	0.0000	0.0000	0.0000	211.6690	498.5641	769.2977	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3434.0979	
Space heating per m2											(98c) / (4) =	34.2998	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	745.9381	540.9521	411.4434	192.4725	63.7609	0.0000	0.0000	0.0000	0.0000	211.6690	498.5641	769.2977	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	808.1670	586.0803	445.7675	208.5292	69.0801	0.0000	0.0000	0.0000	0.0000	229.3272	540.1561	833.4754	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.2574	213.2293	226.5081	199.4492	193.4621	174.4864	172.4733	179.3323	181.2786	201.9137	214.3623	238.6935	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4181	86.0560	85.3810	83.9800	81.8565	79.8000	79.8000	79.8000	79.8000	84.1658	85.8875	86.4901	(217)
Fuel for water heating, kWh/month													
	279.1746	247.7799	265.2909	237.4961	236.3430	218.6546	216.1319	224.7271	227.1662	239.9001	249.5851	275.9777	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8838	21.5672	19.4189	14.2271	10.9894	8.9784	10.0249	13.0308	16.9257	22.2074	25.0832	27.6310	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.3364	-38.7585	-58.1208	-68.2538	-76.1132	-71.9329	-71.0239	-65.7885	-57.0137	-45.5670	-29.5168	-22.5811	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-10.3125	-22.0905	-44.6622	-68.2106	-91.3211	-92.1972	-91.1427	-76.6768	-55.5358	-31.9929	-13.8942	-8.1277 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3720.5827	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2918.2272	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.9676	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1237.1705	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5704.6070	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3720.5827	0.2100	781.3224	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2918.2272	0.2100	612.8277	(264)
Space and water heating			1394.1501	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.9676	0.1443	31.3151	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-631.0064	0.1337	-84.3683	
PV Unit electricity exported	-606.1641	0.1254	-76.0132	
Total			-160.3815	(269)
Total CO2, kg/year			1277.0130	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3720.5827	1.1300	4204.2585	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2918.2272	1.1300	3297.5967	(278)
Space and water heating			7501.8552	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.9676	1.5338	332.7922	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-631.0064	1.4941	-942.7860	
PV Unit electricity exported	-606.1641	0.4603	-279.0058	
Total			-1221.7918	(283)
Total Primary energy kWh/year			6742.9564	(286)
Target Primary Energy Rate (TPER)			67.3500	(287)

Full SAP Calculation Printout

Plot Reference	P-27	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-27
Plot Address	Flat 7, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	80 C	**DER**	4.82	**TER**	12.75
Environmental	96 A	**% DER < TER**			62.20
CO_2 Emissions (t/year)	0.39	**DFEE**	37.39	**TFEE**	41.22
Compliance Check	See BREL	**% DFEE < TFEE**			9.28
% DPER < TPER	26.37	**DPER**	49.59	**TPER**	67.35

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.1200	(1b)	x 2.5500	(2b) =	255.3060	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.1200					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	255.3060	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		4 * 10 =	40.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		40.0000 / (5) =	0.1567 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.5900 (17)
Infiltration rate			0.2862 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2432 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3101	0.3041	0.2980	0.2676	0.2615	0.2311	0.2311	0.2250	0.2432	0.2615	0.2737	0.2858	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5481	0.5462	0.5444	0.5358	0.5342	0.5267	0.5267	0.5253	0.5296	0.5342	0.5374	0.5408	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			19.3100	1.2357	23.8622			(27)
Brickwork	94.2100	23.6500	70.5600	0.2100	14.8176	110.0000	7761.5999	(29a)
Communal Wall	7.2800	2.1500	5.1300	0.2200	1.1286	110.0000	564.3000	(29a)
Stairwell Wall	8.5100		8.5100	0.2500	2.1275	110.0000	936.1000	(29a)
Terrace Roof	51.6000		51.6000	0.1300	6.7080	9.0000	464.4000	(30)
Total net area of external elements Aum(A, m2)			161.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.1933			(33)
Main dwelling								
Party Wall 1			42.5800	0.0000	0.0000	110.0000	4683.8002	(32)
Party Floor 1			100.1200			70.0000	7008.4000	(32d)
Party Ceiling 1			48.5200			30.0000	1455.6000	(32b)
Internal Wall 1			215.3200			9.0000	1937.8801	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 24812.0802	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	247.8234	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	31.8900	0.0380	1.2118	
E16 Corner (normal)	16.1150	0.0540	0.8702	
E17 Corner (inverted - internal area greater than external area)	6.4460	-0.0970	-0.6253	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.4200	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	10.8800	0.0500	0.5440	
E4 Jamb	37.8000	0.0160	0.6048	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.5100	0.3300	1.4883	
E15 Flat roof with parapet	27.3200	0.1500	4.0980	
E25 Staggered party wall between dwellings	12.8900	0.0310	0.3996	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.3355	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	67.5288	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.1775	46.0201	45.8659	45.1415	45.0060	44.3750	44.3750	44.2582	44.6180	45.0060	45.2801	45.5668	(38)
Heat transfer coeff	113.7062	113.5489	113.3947	112.6703	112.5347	111.9038	111.9038	111.7870	112.1468	112.5347	112.8089	113.0956	(39)
Average = Sum(39)m / 12 =												112.6696	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1357	1.1341	1.1326	1.1254	1.1240	1.1177	1.1177	1.1165	1.1201	1.1240	1.1267	1.1296	(40)
HLP (average)												1.1253	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7406 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

30.2991	29.8492	29.2155	28.0471	27.1722	26.2021	25.6781	26.3074	26.9925	28.0305	29.2230	30.1967	(42b)

Hot water usage for other uses

42.6968	41.1442	39.5916	38.0390	36.4864	34.9338	34.9338	36.4864	38.0390	39.5916	41.1442	42.6968	(42c)

Average daily hot water use (litres/day) 66.9074 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	72.9960	70.9934	68.8071	66.0861	63.6586	61.1359	60.6119	62.7938	65.0315	67.6222	70.3672	72.8935	(44)
Energy conte	115.6078	101.0936	105.7539	90.4686	85.6967	75.1737	73.3049	77.7518	80.1904	91.7626	100.2510	114.1337	(45)
Energy content (annual)										Total = Sum(45)m =		1111.1887	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	98.2666	85.9296	89.8908	76.8983	72.8422	63.8977	62.3091	66.0890	68.1618	77.9982	85.2133	97.0136	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	98.2666	85.9296	89.8908	76.8983	72.8422	63.8977	62.3091	66.0890	68.1618	77.9982	85.2133	97.0136	(64)
									Total per year (kWh/year) = Sum(64)m =			944.5104	(64)
12Total per year (kWh/year)												945	(64)
Electric shower(s)	56.1954	50.0706	54.6752	52.1759	53.1549	50.7046	52.3948	53.1549	52.1759	54.6752	53.6471	56.1954	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			639.2199	(64a)
Heat gains from water heating, kWh/month	38.6155	34.0000	36.1415	32.2685	31.4993	28.6506	28.6760	29.8110	30.0844	33.1684	34.7151	38.3023	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.3857	143.2485	129.3857	133.6986	129.3857	133.6986	129.3857	129.3857	133.6986	129.3857	133.6986	129.3857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.5216	259.1835	252.4756	238.1954	220.1691	203.2269	191.9085	189.2466	195.9545	210.2347	228.2610	245.2032	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	(71)
Water heating gains (Table 5)	51.9026	50.5953	48.5773	44.8174	42.3377	39.7925	38.5430	40.0685	41.7839	44.5811	48.2154	51.4815	(72)
Total internal gains	501.9194	517.1368	494.5481	480.8208	456.0020	440.8274	423.9467	422.8103	435.5464	448.3111	474.2845	490.1800	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	19.6403	0.3300	0.0000	0.7700	21.6592	(80)
East	4.9100	19.6403	0.3100	0.0000	0.7700	23.0187	(76)
Southeast	14.4000	36.7938	0.3100	0.0000	0.7700	126.4707	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	171.1486	302.8258	438.6902	575.1365	666.3377	669.4710	642.2638	574.1889	486.5599	341.7988	207.1908	144.9735	(83)
Total gains	673.0680	819.9626	933.2383	1055.9573	1122.3397	1110.2984	1066.2105	996.9993	922.1063	790.1099	681.4754	635.1535	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.6145	60.6985	60.7810	61.1718	61.2455	61.5908	61.5908	61.6552	61.4573	61.2455	61.0966	60.9418	
alpha	5.0410	5.0466	5.0521	5.0781	5.0830	5.1061	5.1061	5.1103	5.0972	5.0830	5.0731	5.0628	
util living area	0.9965	0.9903	0.9744	0.9219	0.8051	0.6188	0.4569	0.5071	0.7551	0.9515	0.9917	0.9974	(86)
MIT	19.6724	19.9013	20.2052	20.5778	20.8451	20.9684	20.9944	20.9907	20.9159	20.5465	20.0340	19.6294	(87)
Th 2	19.9718	19.9731	19.9743	19.9802	19.9813	19.9864	19.9864	19.9874	19.9844	19.9813	19.9791	19.9767	(88)
util rest of house	0.9954	0.9871	0.9660	0.8968	0.7495	0.5316	0.3543	0.3999	0.6732	0.9304	0.9885	0.9965	(89)
MIT 2	18.7698	18.9977	19.2968	19.6538	19.8830	19.9729	19.9851	19.9849	19.9419	19.6340	19.1353	18.7308	(90)
Living area fraction									fLA = Living area / (4) =			0.3022	(91)
MIT	19.0426	19.2708	19.5714	19.9330	20.1738	20.2738	20.2901	20.2889	20.2363	19.9098	19.4069	19.0024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0426	19.2708	19.5714	19.9330	20.1738	20.2738	20.2901	20.2889	20.2363	19.9098	19.4069	19.0024	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9843	0.9619	0.8955	0.7609	0.5573	0.3854	0.4325	0.6951	0.9286	0.9860	0.9954	(94)
Useful gains	669.0023	807.1051	897.6901	945.6020	853.9958	618.7167	410.9382	431.1758	640.9540	733.6792	671.9631	632.2294	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1676.3237	1631.7847	1482.2263	1243.0957	953.5940	634.9168	412.9380	434.7241	688.1689	1047.6742	1388.3328	1674.0885	(97)
Space heating kWh	749.4472	554.1847	434.8950	214.1954	74.1010	0.0000	0.0000	0.0000	0.0000	233.6123	515.7862	775.1431	(98a)
Space heating requirement - total per year (kWh/year)												3551.3649	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	749.4472	554.1847	434.8950	214.1954	74.1010	0.0000	0.0000	0.0000	0.0000	233.6123	515.7862	775.1431	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3551.3649	
Space heating per m2										(98c) / (4) =		35.4711	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1051.8959	828.0882	849.5810	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8982	0.9475	0.9275	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	944.7782	784.6015	788.0170	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1245.9326	1196.9011	1118.5534	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	216.8312	306.7509	245.9191	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	54.2078	76.6877	61.4798	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												192.3753	(107)
Energy for space heating												35.4711	(99)
Energy for space cooling												1.9214	(108)
Total												37.3925	(109)
Fabric Energy Efficiency (DFEE)												37.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.1200	(1b)	x 2.5500	(2b) =	255.3060	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.1200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		255.3060	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1567	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4067	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3457	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4407	0.4321	0.4235	0.3802	0.3716	0.3284	0.3284	0.3197	0.3457	0.3716	0.3889	0.4062	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5971	0.5934	0.5897	0.5723	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5756	0.5825	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.8800	1.1450	26.1985			(27)
Brickwork	94.2100	22.8800	71.3300	0.1800	12.8394			(29a)
Communal Wall	7.2800	2.1500	5.1300	0.1800	0.9234			(29a)
Stairwell Wall	8.5100		8.5100	0.1800	1.5318			(29a)
Terrace Roof	51.6000		51.6000	0.1100	5.6760			(30)
Total net area of external elements Aum(A, m2)			161.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.3191			(33)
Main dwelling								
Party Wall 1			42.5800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	247.8234 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	31.8900	0.0700	2.2323
E16 Corner (normal)	16.1150	0.0900	1.4503
E17 Corner (inverted - internal area greater than external area)	6.4460	-0.0900	-0.5801
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.4200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.8800	0.0500	0.5440
E4 Jamb	37.8000	0.0500	1.8900
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.5100	0.0200	0.0902
E15 Flat roof with parapet	27.3200	0.5600	15.2992
E25 Staggered party wall between dwellings	12.8900	0.0600	0.7734
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	25.6193	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 74.9384	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	50.3082	49.9905	49.6790	48.2161	47.9424	46.6683	46.6683	46.4323	47.1591	47.9424	48.4961	49.0750	(38)
Heat transfer coeff	125.2466	124.9288	124.6174	123.1545	122.8808	121.6067	121.6067	121.3707	122.0975	122.8808	123.4345	124.0134	(39)
Average = Sum(39)m / 12 =												123.1532	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2510	1.2478	1.2447	1.2301	1.2273	1.2146	1.2146	1.2123	1.2195	1.2273	1.2329	1.2386	(40)
HLP (average)												1.2301	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7406 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	30.2991	29.8492	29.2155	28.0471	27.1722	26.2021	25.6781	26.3074	26.9925	28.0305	29.2230	30.1967	(42b)
Hot water usage for other uses													
	42.6968	41.1442	39.5916	38.0390	36.4864	34.9338	34.9338	36.4864	38.0390	39.5916	41.1442	42.6968	(42c)
Average daily hot water use (litres/day)												66.9074	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	72.9960	70.9934	68.8071	66.0861	63.6586	61.1359	60.6119	62.7938	65.0315	67.6222	70.3672	72.8935	(44)
Energy conte	115.6078	101.0936	105.7539	90.4686	85.6967	75.1737	73.3049	77.7518	80.1904	91.7626	100.2510	114.1337	(45)
Energy content (annual)										Total = Sum(45)m =		1111.1887	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	98.2666	85.9296	89.8908	76.8983	72.8422	63.8977	62.3091	66.0890	68.1618	77.9982	85.2133	97.0136	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	98.2666	85.9296	89.8908	76.8983	72.8422	63.8977	62.3091	66.0890	68.1618	77.9982	85.2133	97.0136	(64)
										Total per year (kWh/year) = Sum(64)m =		944.5104	(64)
12Total per year (kWh/year)												945	(64)
Electric shower(s)													
	56.1954	50.0706	54.6752	52.1759	53.1549	50.7046	52.3948	53.1549	52.1759	54.6752	53.6471	56.1954	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		639.2199	(64a)

Heat gains from water heating, kWh/month

	38.6155	34.0000	36.1415	32.2685	31.4993	28.6506	28.6760	29.8110	30.0844	33.1684	34.7151	38.3023 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	129.3857	143.2485	129.3857	133.6986	129.3857	133.6986	129.3857	129.3857	133.6986	129.3857	133.6986	129.3857 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	256.5216	259.1835	252.4756	238.1954	220.1691	203.2269	191.9085	189.2466	195.9545	210.2347	228.2610	245.2032 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254 (71)

Water heating gains (Table 5)

	51.9026	50.5953	48.5773	44.8174	42.3377	39.7925	38.5430	40.0685	41.7839	44.5811	48.2154	51.4815 (72)

Total internal gains

	501.9194	517.1368	494.5481	480.8208	456.0020	440.8274	423.9467	422.8103	435.5464	448.3111	474.2845	490.1800 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.7500	19.6403	0.6300	0.7000	0.7700	28.5110	(76)
Southeast	13.9300	36.7938	0.6300	0.7000	0.7700	156.6383	(77)
West	4.2000	19.6403	0.6300	0.7000	0.7700	25.2097	(80)

Solar gains	210.3591	371.9022	538.1321	704.7413	815.9864	819.6470	786.4064	703.3708	596.5724	419.5824	254.6001	178.2271	(83)
Total gains	712.2785	889.0390	1032.6803	1185.5621	1271.9884	1260.4744	1210.3530	1126.1811	1032.1188	867.8935	728.8846	668.4071	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0294	55.1694	55.3072	55.9642	56.0889	56.6765	56.6765	56.7867	56.4487	56.0889	55.8373	55.5766	
alpha	4.6686	4.6780	4.6871	4.7309	4.7393	4.7784	4.7784	4.7858	4.7632	4.7393	4.7225	4.7051	
util living area													
	0.9957	0.9876	0.9675	0.9051	0.7788	0.5923	0.4370	0.4869	0.7336	0.9425	0.9898	0.9968	(86)
MIT	19.5367	19.7997	20.1440	20.5568	20.8383	20.9662	20.9935	20.9894	20.9092	20.5110	19.9441	19.4966	(87)
Th 2	19.8794	19.8820	19.8844	19.8960	19.8982	19.9083	19.9083	19.9102	19.9044	19.8982	19.8938	19.8892	(88)
util rest of house													
	0.9942	0.9836	0.9569	0.8755	0.7180	0.5017	0.3312	0.3760	0.6461	0.9177	0.9859	0.9957	(89)
MIT 2	18.5636	18.8258	19.1641	19.5601	19.7982	19.8943	19.9068	19.9075	19.8599	19.5303	18.9798	18.5312	(90)
Living area fraction									fLA = Living area / (4) =			0.3022	(91)
MIT	18.8577	19.1202	19.4603	19.8613	20.1126	20.2183	20.2353	20.2345	20.1770	19.8267	19.2713	18.8229	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8577	19.1202	19.4603	19.8613	20.1126	20.2183	20.2353	20.2345	20.1770	19.8267	19.2713	18.8229	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9800	0.9519	0.8745	0.7308	0.5283	0.3634	0.4097	0.6696	0.9157	0.9828	0.9942	(94)
Useful gains	706.8603	871.2682	983.0013	1036.7487	929.6158	665.9537	439.7870	461.3934	691.0855	794.7614	716.3558	664.5404	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1823.3046	1776.5083	1615.0732	1349.9370	1033.7411	683.2226	442.0738	465.3945	741.9870	1133.7840	1502.3565	1813.4397	(97)
Space heating kWh													
	830.6345	608.3213	470.2615	225.4956	77.4692	0.0000	0.0000	0.0000	0.0000	252.2329	565.9205	854.7811	(98a)
Space heating requirement - total per year (kWh/year)												3885.1166	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	830.6345	608.3213	470.2615	225.4956	77.4692	0.0000	0.0000	0.0000	0.0000	252.2329	565.9205	854.7811	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3885.1166	
Space heating per m2											(98c) / (4) =	38.8046	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1143.1028	899.8894	922.4176	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9035	0.9489	0.9296	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1032.7801	853.9114	857.5043	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1421.4630	1365.3794	1269.5451	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	279.8517	380.5322	306.5584	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	69.9629	95.1331	76.6396	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												241.7356	(107)
Energy for space heating												38.8046	(99)
Energy for space cooling												2.4145	(108)

Total	41.2191 (109)
Fabric Energy Efficiency (TFEE)	41.2 (109)

Full SAP Calculation Printout

Plot Reference	P-27	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-27
Plot Address	Flat 7, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	80 C	**DER**	4.82	**TER**	12.75
Environmental	96 A	**% DER < TER**			62.20
CO_2 Emissions (t/year)	0.39	**DFEE**	37.39	**TFEE**	41.22
Compliance Check	See BREL	**% DFEE < TFEE**			9.28
% DPER < TPER	26.37	**DPER**	49.59	**TPER**	67.35

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.1200	(1b)	x 2.5500	(2b) =	255.3060	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.1200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	255.3060	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5900	(17)
Infiltration rate		0.1295	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1101	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1403	0.1376	0.1348	0.1211	0.1183	0.1046	0.1046	0.1018	0.1101	0.1183	0.1238	0.1293	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2803	0.2776	0.2748	0.2611	0.2583	0.2446	0.2446	0.2418	0.2501	0.2583	0.2638	0.2693	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			19.3100	1.2357	23.8622			(27)
Brickwork	94.2100	23.6500	70.5600	0.2100	14.8176	110.0000	7761.5999	(29a)
Communal Wall	7.2800	2.1500	5.1300	0.2200	1.1286	110.0000	564.3000	(29a)
Stairwell Wall	8.5100		8.5100	0.2500	2.1275	110.0000	936.1000	(29a)
Terrace Roof	51.6000		51.6000	0.1300	6.7080	9.0000	464.4000	(30)
Total net area of external elements Aum(A, m2)			161.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1933			(33)
Main dwelling								
Party Wall 1			42.5800	0.0000	0.0000	110.0000	4683.8002	(32)
Party Floor 1			100.1200			70.0000	7008.4000	(32d)
Party Ceiling 1			48.5200			30.0000	1455.6000	(32b)
Internal Wall 1			215.3200			9.0000	1937.8801	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24812.0802 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 247.8234 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	31.8900	0.0380	1.2118
E16 Corner (normal)	16.1150	0.0540	0.8702
E17 Corner (inverted - internal area greater than external area)	6.4460	-0.0970	-0.6253
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.4200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.8800	0.0500	0.5440
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.5100	0.3300	1.4883
E15 Flat roof with parapet	27.3200	0.1500	4.0980
E25 Staggered party wall between dwellings	12.8900	0.0310	0.3996
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.3355 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 67.5288 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.6194	23.3875	23.1557	21.9965	21.7646	20.6054	20.6054	20.3735	21.0691	21.7646	22.2283	22.6920	(38)
Heat transfer coeff	91.1482	90.9163	90.6845	89.5252	89.2934	88.1342	88.1342	87.9023	88.5979	89.2934	89.7571	90.2208	(39)
Average = Sum(39)m / 12 =												89.4673	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9104	0.9081	0.9058	0.8942	0.8919	0.8803	0.8803	0.8780	0.8849	0.8919	0.8965	0.9011	(40)
HLP (average)												0.8936	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7406 (42)
Hot water usage for mixer showers

70.1712	69.1167	67.5800	64.6399	62.4701	60.0504	58.6751	60.2001	61.8719	64.4699	67.4731	69.9024	(42a)

Hot water usage for baths

30.2991	29.8492	29.2155	28.0471	27.1722	26.2021	25.6781	26.3074	26.9925	28.0305	29.2230	30.1967	(42b)

Hot water usage for other uses

42.6968	41.1442	39.5916	38.0390	36.4864	34.9338	34.9338	36.4864	38.0390	39.5916	41.1442	42.6968	(42c)

Average daily hot water use (litres/day) 131.6029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1672	140.1100	136.3871	130.7260	126.1287	121.1864	119.2870	122.9939	126.9034	132.0920	137.8404	142.7959	(44)
Energy conte	226.7418	199.5148	209.6219	178.9573	169.7935	149.0128	144.2673	152.2922	156.4845	179.2476	196.3789	223.5839	(45)
Energy content (annual)										Total = Sum(45)m =		2185.8965	
Distribution loss (46)m = 0.15 x (45)m	34.0113	29.9272	31.4433	26.8436	25.4690	22.3519	21.6401	22.8438	23.4727	26.8871	29.4568	33.5376	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)
									Total per year (kWh/year) = Sum(64)m =		2530.8215	(64)
12Total per year (kWh/year)											2531	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

75.3917	66.3387	69.6993	59.5033	56.4563	49.5467	47.9689	50.6371	52.0311	59.5998	65.2960	74.3416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.3857	143.2485	129.3857	133.6986	129.3857	133.6986	129.3857	129.3857	133.6986	129.3857	133.6986	129.3857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.5216	259.1835	252.4756	238.1954	220.1691	203.2269	191.9085	189.2466	195.9545	210.2347	228.2610	245.2032	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	(71)
Water heating gains (Table 5)	101.3329	98.7183	93.6818	82.6435	75.8822	68.8149	64.4743	68.0607	72.2654	80.1073	90.6888	99.9216	(72)
Total internal gains	551.3497	565.2598	539.6527	518.6469	489.5465	469.8499	449.8780	450.8025	466.0280	483.8373	516.7579	538.6200	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	19.6403	0.3300	0.0000	0.7700	21.6592	(80)

East			4.9100		19.6403		0.3100		0.0000		0.7700		23.0187 (76)
Southeast			14.4000		36.7938		0.3100		0.0000		0.7700		126.4707 (77)
Solar gains	171.1486	302.8258	438.6902	575.1365	666.3377	669.4710	642.2638	574.1889	486.5599	341.7988	207.1908	144.9735	(83)
Total gains	722.4983	868.0856	978.3429	1093.7834	1155.8842	1139.3209	1092.1418	1024.9914	952.5878	825.6361	723.9488	683.5935	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6158	75.8086	76.0025	76.9866	77.1865	78.2017	78.2017	78.4080	77.7925	77.1865	76.7877	76.3931	
alpha	6.0411	6.0539	6.0668	6.1324	6.1458	6.2134	6.2134	6.2272	6.1862	6.1458	6.1192	6.0929	
util living area	0.9941	0.9823	0.9514	0.8556	0.6892	0.4919	0.3547	0.3938	0.6263	0.9052	0.9847	0.9957	(86)
MIT	20.0935	20.3107	20.5665	20.8333	20.9617	20.9959	20.9995	20.9992	20.9834	20.7949	20.3953	20.0567	(87)
Th 2	20.1587	20.1606	20.1626	20.1725	20.1744	20.1843	20.1843	20.1863	20.1803	20.1744	20.1705	20.1665	(88)
util rest of house	0.9924	0.9773	0.9382	0.8229	0.6371	0.4306	0.2892	0.3245	0.5582	0.8746	0.9794	0.9944	(89)
MIT 2	19.1045	19.3802	19.6975	20.0141	20.1449	20.1821	20.1841	20.1860	20.1702	19.9815	19.4971	19.0638	(90)
Living area fraction									fLA = Living area / (4) =			0.3022	(91)
MIT	19.4034	19.6615	19.9601	20.2617	20.3918	20.4280	20.4306	20.4317	20.4159	20.2274	19.7686	19.3638	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4034	19.6615	19.9601	20.2617	20.3918	20.4280	20.4306	20.4317	20.4159	20.2274	19.7686	19.3638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9902	0.9735	0.9344	0.8267	0.6512	0.4491	0.3090	0.3455	0.5782	0.8768	0.9761	0.9926	(94)
Useful gains	715.4361	845.0887	914.1782	904.2618	752.7100	511.6445	337.4472	354.0882	550.7946	723.9239	706.6536	678.5661	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1376.6492	1342.0578	1220.6243	1017.1599	776.1185	513.6491	337.6056	354.3995	559.5783	859.6589	1137.0926	1368.0942	(97)
Space heating kWh	491.9426	333.9632	227.9959	81.2866	17.4159	0.0000	0.0000	0.0000	0.0000	100.9869	309.9161	513.0089	(98a)
Space heating requirement - total per year (kWh/year)												2076.5160	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	491.9426	333.9632	227.9959	81.2866	17.4159	0.0000	0.0000	0.0000	0.0000	100.9869	309.9161	513.0089	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2076.5160	
Space heating per m2											(98c) / (4) =	20.7403	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	491.9426	333.9632	227.9959	81.2866	17.4159	0.0000	0.0000	0.0000	0.0000	100.9869	309.9161	513.0089	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	491.9426	333.9632	227.9959	81.2866	17.4159	0.0000	0.0000	0.0000	0.0000	100.9869	309.9161	513.0089	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	70.7939	62.4818	66.0603	57.3203	55.0478	49.0406	47.9898	50.2087	51.1066	57.6618	62.1373	69.9207	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.2030	14.6350	16.2030	15.6803	16.2030	15.6803	16.2030	16.2030	15.6803	16.2030	15.6803	16.2030	(231)
Lighting	26.3343	21.1264	19.0219	13.9363	10.7648	8.7949	9.8200	12.7644	16.5797	21.7535	24.5705	27.0662	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2076.5160	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	699.7695	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	190.7774	(230a)
Total electricity for the above, kWh/year	190.7774	(231)
Electricity for lighting (calculated in Appendix L)	212.5329	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3179.5959	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2076.5160	0.1573	326.5790	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	699.7695	0.1412	98.7988	(264)
Space and water heating			425.3778	(265)
Pumps, fans and electric keep-hot	190.7774	0.1387	26.4632	(267)
Energy for lighting	212.5329	0.1443	30.6751	(268)
Total CO2, kg/year			482.5160	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2076.5160	1.5822	3285.4587	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	699.7695	1.5221	1065.1015	(278)
Space and water heating			4350.5602	(279)
Pumps, fans and electric keep-hot	190.7774	1.5128	288.6081	(281)
Energy for lighting	212.5329	1.5338	325.9901	(282)
Total Primary energy kWh/year			4965.1583	(286)
Dwelling Primary energy Rate (DPER)			49.5900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.1200	(1b) x	2.5500	(2b) =	255.3060	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.1200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		255.3060	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1567	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4067	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3457	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4407	0.4321	0.4235	0.3802	0.3716	0.3284	0.3284	0.3197	0.3457	0.3716	0.3889	0.4062	(22b)
Effective ac	0.5971	0.5934	0.5897	0.5723	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5756	0.5825	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.8800	1.1450	26.1985			(27)
Brickwork	94.2100	22.8800	71.3300	0.1800	12.8394			(29a)
Communal Wall	7.2800	2.1500	5.1300	0.1800	0.9234			(29a)
Stairwell Wall	8.5100		8.5100	0.1800	1.5318			(29a)
Terrace Roof	51.6000		51.6000	0.1100	5.6760			(30)
Total net area of external elements Aum(A, m2)			161.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.3191			(33)
Main dwelling								
Party Wall 1			42.5800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	247.8234	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	31.8900	0.0700	2.2323
E16 Corner (normal)	16.1150	0.0900	1.4503
E17 Corner (inverted - internal area greater than external area)	6.4460	-0.0900	-0.5801
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.4200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.8800	0.0500	0.5440
E4 Jamb	37.8000	0.0500	1.8900
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.5100	0.0200	0.0902
E15 Flat roof with parapet	27.3200	0.5600	15.2992
E25 Staggered party wall between dwellings	12.8900	0.0600	0.7734
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		25.6193	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	74.9384	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	50.3082	49.9905	49.6790	48.2161	47.9424	46.6683	46.6683	46.4323	47.1591	47.9424	48.4961	49.0750	(38)
Heat transfer coeff													
	125.2466	124.9288	124.6174	123.1545	122.8808	121.6067	121.6067	121.3707	122.0975	122.8808	123.4345	124.0134	(39)
Average = Sum(39)m / 12 =												123.1532	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2510	1.2478	1.2447	1.2301	1.2273	1.2146	1.2146	1.2123	1.2195	1.2273	1.2329	1.2386	(40)
HLP (average)												1.2301	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7406	(42)

Hot water usage for mixer showers

	70.1712	69.1167	67.5800	64.6399	62.4701	60.0504	58.6751	60.2001	61.8719	64.4699	67.4731	69.9024	(42a)

Hot water usage for baths

	30.2991	29.8492	29.2155	28.0471	27.1722	26.2021	25.6781	26.3074	26.9925	28.0305	29.2230	30.1967	(42b)

Hot water usage for other uses

	42.6968	41.1442	39.5916	38.0390	36.4864	34.9338	34.9338	36.4864	38.0390	39.5916	41.1442	42.6968	(42c)

Average daily hot water use (litres/day)	131.6029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.1672	140.1100	136.3871	130.7260	126.1287	121.1864	119.2870	122.9939	126.9034	132.0920	137.8404	142.7959	(44)
Energy conte	226.7418	199.5148	209.6219	178.9573	169.7935	149.0128	144.2673	152.2922	156.4845	179.2476	196.3789	223.5839	(45)
Energy content (annual)										Total = Sum(45)m =		2185.8965	
Distribution loss (46)m = 0.15 x (45)m													
	34.0113	29.9272	31.4433	26.8436	25.4690	22.3519	21.6401	22.8438	23.4727	26.8871	29.4568	33.5376	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.3367	241.6006	256.2168	224.0492	216.3884	194.1046	190.8622	198.8871	201.5764	225.8425	241.4707	270.1788	(62)
WWHRS	-32.0793	-28.3712	-29.7087	-24.6000	-22.9263	-19.6182	-18.3889	-19.5548	-20.2978	-23.9288	-27.1084	-31.4853	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	241.2574	213.2293	226.5081	199.4492	193.4621	174.4864	172.4733	179.3323	181.2786	201.9137	214.3623	238.6935	(64)
										Total per year (kWh/year) = Sum(64)m =		2436.4460	(64)
12Total per year (kWh/year)												2436	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	112.6676	100.0073	106.9752	95.5768	93.7323	85.6202	85.2448	87.9131	88.1046	96.8758	101.3694	111.6176	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	137.0317	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.3857	143.2485	129.3857	133.6986	129.3857	133.6986	129.3857	129.3857	133.6986	129.3857	133.6986	129.3857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.5216	259.1835	252.4756	238.1954	220.1691	203.2269	191.9085	189.2466	195.9545	210.2347	228.2610	245.2032	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	36.7032	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	(71)
Water heating gains (Table 5)													
	151.4349	148.8203	143.7839	132.7455	125.9842	118.9170	114.5763	118.1627	122.3675	130.2093	140.7909	150.0236	(72)
Total internal gains													
	604.4518	618.3618	592.7547	571.7489	542.6485	519.9519	499.9800	500.9045	516.1300	536.9393	569.8600	591.7220	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.7500	19.6403	0.6300	0.7000	0.7700	28.5110	(76)
Southeast	13.9300	36.7938	0.6300	0.7000	0.7700	156.6383	(77)
West	4.2000	19.6403	0.6300	0.7000	0.7700	25.2097	(80)

Solar gains	210.3591	371.9022	538.1321	704.7413	815.9864	819.6470	786.4064	703.3708	596.5724	419.5824	254.6001	178.2271	(83)
Total gains	814.8108	990.2640	1130.8868	1276.4902	1358.6349	1339.5989	1286.3864	1204.2753	1112.7024	956.5217	824.4601	769.9491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0294	55.1694	55.3072	55.9642	56.0889	56.6765	56.6765	56.7867	56.4487	56.0889	55.8373	55.5766	
alpha	4.6686	4.6780	4.6871	4.7309	4.7393	4.7784	4.7784	4.7858	4.7632	4.7393	4.7225	4.7051	
util living area													
	0.9925	0.9812	0.9553	0.8828	0.7476	0.5620	0.4123	0.4572	0.6960	0.9214	0.9834	0.9942	(86)
MIT	19.6420	19.8988	20.2300	20.6140	20.8650	20.9729	20.9949	20.9918	20.9275	20.5784	20.0390	19.6018	(87)
Th 2	19.8794	19.8820	19.8844	19.8960	19.8982	19.9083	19.9083	19.9102	19.9044	19.8982	19.8938	19.8892	(88)
util rest of house													
	0.9901	0.9754	0.9415	0.8490	0.6849	0.4741	0.3119	0.3522	0.6078	0.8903	0.9772	0.9923	(89)
MIT 2	18.3248	18.6509	19.0642	19.5272	19.7933	19.8942	19.9069	19.9076	19.8601	19.5013	18.8398	18.2806	(90)
Living area fraction									fLA = Living area / (4) =			0.3022	(91)
MIT	18.7229	19.0281	19.4165	19.8557	20.1172	20.2202	20.2357	20.2353	20.1827	19.8268	19.2022	18.6799	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7229	19.0281	19.4165	19.8557	20.1172	20.2202	20.2357	20.2353	20.1827	19.8268	19.2022	18.6799	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9695	0.9343	0.8476	0.6982	0.5000	0.3423	0.3840	0.6316	0.8879	0.9720	0.9893	(94)
Useful gains	803.8174	960.0194	1056.6073	1081.9181	948.6084	669.7389	440.3610	462.4600	702.8029	849.2986	801.3801	761.7013	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1806.4225	1765.0076	1609.6227	1349.2410	1034.3086	683.4522	442.1278	465.4928	742.6877	1133.7999	1493.8303	1795.7036	(97)
Space heating kWh													
	745.9381	540.9521	411.4434	192.4725	63.7609	0.0000	0.0000	0.0000	0.0000	211.6690	498.5641	769.2977	(98a)
Space heating requirement - total per year (kWh/year)												3434.0979	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	745.9381	540.9521	411.4434	192.4725	63.7609	0.0000	0.0000	0.0000	0.0000	211.6690	498.5641	769.2977	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3434.0979	
Space heating per m2											(98c) / (4) =	34.2998	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	745.9381	540.9521	411.4434	192.4725	63.7609	0.0000	0.0000	0.0000	0.0000	211.6690	498.5641	769.2977	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	808.1670	586.0803	445.7675	208.5292	69.0801	0.0000	0.0000	0.0000	0.0000	229.3272	540.1561	833.4754	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	241.2574	213.2293	226.5081	199.4492	193.4621	174.4864	172.4733	179.3323	181.2786	201.9137	214.3623	238.6935	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4181	86.0560	85.3810	83.9800	81.8565	79.8000	79.8000	79.8000	79.8000	84.1658	85.8875	86.4901	(217)
Fuel for water heating, kWh/month													
	279.1746	247.7799	265.2909	237.4961	236.3430	218.6546	216.1319	224.7271	227.1662	239.9001	249.5851	275.9777	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8838	21.5672	19.4189	14.2271	10.9894	8.9784	10.0249	13.0308	16.9257	22.2074	25.0832	27.6310	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.3364	-38.7585	-58.1208	-68.2538	-76.1132	-71.9329	-71.0239	-65.7885	-57.0137	-45.5670	-29.5168	-22.5811	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-10.3125	-22.0905	-44.6622	-68.2106	-91.3211	-92.1972	-91.1427	-76.6768	-55.5358	-31.9929	-13.8942	-8.1277 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3720.5827	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2918.2272	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.9676	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1237.1705	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5704.6070	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3720.5827	0.2100	781.3224	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2918.2272	0.2100	612.8277	(264)
Space and water heating			1394.1501	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.9676	0.1443	31.3151	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-631.0064	0.1337	-84.3683	
PV Unit electricity exported	-606.1641	0.1254	-76.0132	
Total			-160.3815	(269)
Total CO2, kg/year			1277.0130	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3720.5827	1.1300	4204.2585	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2918.2272	1.1300	3297.5967	(278)
Space and water heating			7501.8552	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.9676	1.5338	332.7922	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-631.0064	1.4941	-942.7860	
PV Unit electricity exported	-606.1641	0.4603	-279.0058	
Total			-1221.7918	(283)
Total Primary energy kWh/year			6742.9564	(286)
Target Primary Energy Rate (TPER)			67.3500	(287)

Full SAP Calculation Printout

Plot Reference	P-27	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-27
Plot Address	Flat 7, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	80 C	**DER**	4.82	**TER**	12.75
Environmental	96 A	**% DER < TER**			62.20
CO_2 Emissions (t/year)	0.39	**DFEE**	37.39	**TFEE**	41.22
Compliance Check	See BREL	**% DFEE < TFEE**			9.28
% DPER < TPER	26.37	**DPER**	49.59	**TPER**	67.35

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.1200	(1b)	x 2.5500	(2b) =	255.3060	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.1200					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	255.3060	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5900 (17)
Infiltration rate		0.1295 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1101 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1403	0.1376	0.1348	0.1211	0.1183	0.1046	0.1046	0.1018	0.1101	0.1183	0.1238	0.1293	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.0000 (23c)

Effective ac	0.2803	0.2776	0.2748	0.2611	0.2583	0.2446	0.2446	0.2418	0.2501	0.2583	0.2638	0.2693	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			19.3100	1.2357	23.8622			(27)
Brickwork	94.2100	23.6500	70.5600	0.2100	14.8176	110.0000	7761.5999	(29a)
Communal Wall	7.2800	2.1500	5.1300	0.2200	1.1286	110.0000	564.3000	(29a)
Stairwell Wall	8.5100		8.5100	0.2500	2.1275	110.0000	936.1000	(29a)
Terrace Roof	51.6000		51.6000	0.1300	6.7080	9.0000	464.4000	(30)
Total net area of external elements Aum(A, m2)			161.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.1933			(33)
Main dwelling								
Party Wall 1			42.5800	0.0000	0.0000	110.0000	4683.8002	(32)
Party Floor 1			100.1200			70.0000	7008.4000	(32d)
Party Ceiling 1			48.5200			30.0000	1455.6000	(32b)
Internal Wall 1			215.3200			9.0000	1937.8801	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24812.0802 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 247.8234 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	31.8900	0.0380	1.2118
E16 Corner (normal)	16.1150	0.0540	0.8702
E17 Corner (inverted - internal area greater than external area)	6.4460	-0.0970	-0.6253
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.4200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.8800	0.0500	0.5440
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.5100	0.3300	1.4883
E15 Flat roof with parapet	27.3200	0.1500	4.0980
E25 Staggered party wall between dwellings	12.8900	0.0310	0.3996
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.3355 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 67.5288 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.6194	23.3875	23.1557	21.9965	21.7646	20.6054	20.6054	20.3735	21.0691	21.7646	22.2283	22.6920	(38)
Heat transfer coeff	91.1482	90.9163	90.6845	89.5252	89.2934	88.1342	88.1342	87.9023	88.5979	89.2934	89.7571	90.2208	(39)
Average = Sum(39)m / 12 =												89.4673	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9104	0.9081	0.9058	0.8942	0.8919	0.8803	0.8803	0.8780	0.8849	0.8919	0.8965	0.9011	(40)
HLP (average)												0.8936	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7406 (42)
Hot water usage for mixer showers

70.1712	69.1167	67.5800	64.6399	62.4701	60.0504	58.6751	60.2001	61.8719	64.4699	67.4731	69.9024	(42a)

Hot water usage for baths

30.2991	29.8492	29.2155	28.0471	27.1722	26.2021	25.6781	26.3074	26.9925	28.0305	29.2230	30.1967	(42b)

Hot water usage for other uses

42.6968	41.1442	39.5916	38.0390	36.4864	34.9338	34.9338	36.4864	38.0390	39.5916	41.1442	42.6968	(42c)

Average daily hot water use (litres/day) 131.6029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1672	140.1100	136.3871	130.7260	126.1287	121.1864	119.2870	122.9939	126.9034	132.0920	137.8404	142.7959	(44)
Energy conte	226.7418	199.5148	209.6219	178.9573	169.7935	149.0128	144.2673	152.2922	156.4845	179.2476	196.3789	223.5839	(45)
Energy content (annual)										Total = Sum(45)m =		2185.8965	
Distribution loss (46)m = 0.15 x (45)m	34.0113	29.9272	31.4433	26.8436	25.4690	22.3519	21.6401	22.8438	23.4727	26.8871	29.4568	33.5376	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)
									Total per year (kWh/year) = Sum(64)m =		2530.8215	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

75.3917	66.3387	69.6993	59.5033	56.4563	49.5467	47.9689	50.6371	52.0311	59.5998	65.2960	74.3416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.0862	26.7223	21.7321	16.4526	12.2985	10.3829	11.2191	14.5830	19.5733	24.8528	29.0068	30.9224	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.8681	386.8411	376.8293	355.5154	328.6105	303.3237	286.4305	282.4576	292.4693	313.7832	340.6881	365.9749	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	(71)
Water heating gains (Table 5)	101.3329	98.7183	93.6818	82.6435	75.8822	68.8149	64.4743	68.0607	72.2654	80.1073	90.6888	99.9216	(72)
Total internal gains	623.2843	621.2788	601.2403	563.6086	525.7883	491.5186	471.1211	474.0984	493.3052	527.7404	569.3809	605.8160	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	19.6403	0.3300	0.0000	0.7700	21.6592	(80)
East	4.9100	19.6403	0.3100	0.0000	0.7700	23.0187	(76)

Southeast				14.4000		36.7938		0.3100		0.0000		0.7700	126.4707 (77)
Solar gains	171.1486	302.8258	438.6902	575.1365	666.3377	669.4710	642.2638	574.1889	486.5599	341.7988	207.1908	144.9735 (83)	
Total gains	794.4329	924.1046	1039.9305	1138.7451	1192.1260	1160.9896	1113.3849	1048.2873	979.8650	869.5392	776.5717	750.7895 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6158	75.8086	76.0025	76.9866	77.1865	78.2017	78.2017	78.4080	77.7925	77.1865	76.7877	76.3931	
alpha	6.0411	6.0539	6.0668	6.1324	6.1458	6.2134	6.2134	6.2272	6.1862	6.1458	6.1192	6.0929	
util living area	0.9905	0.9763	0.9378	0.8374	0.6718	0.4830	0.3480	0.3851	0.6108	0.8867	0.9785	0.9930	(86)
MIT	20.1708	20.3665	20.6166	20.8534	20.9666	20.9963	20.9996	20.9993	20.9854	20.8216	20.4485	20.1299	(87)
Th 2	20.1587	20.1606	20.1626	20.1725	20.1744	20.1843	20.1843	20.1863	20.1803	20.1744	20.1705	20.1665	(88)
util rest of house	0.9877	0.9698	0.9218	0.8030	0.6200	0.4227	0.2836	0.3173	0.5436	0.8527	0.9714	0.9909	(89)
MIT 2	19.2025	19.4494	19.7565	20.0349	20.1489	20.1823	20.1842	20.1860	20.1715	20.0096	19.5629	19.1568	(90)
Living area fraction										fLA = Living area / (4) =		0.3022	(91)
MIT	19.4951	19.7266	20.0165	20.2822	20.3960	20.4283	20.4306	20.4318	20.4175	20.2550	19.8305	19.4509	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4951	19.7266	20.0165	20.2822	20.3960	20.4283	20.4306	20.4318	20.4175	20.2550	19.8305	19.4509	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9849	0.9656	0.9186	0.8079	0.6343	0.4409	0.3031	0.3378	0.5634	0.8563	0.9678	0.9885	(94)
Useful gains	782.4004	892.3320	955.2945	919.9378	756.1219	511.8626	337.4661	354.1305	552.0690	744.6296	751.5594	742.1613	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1385.0100	1347.9804	1225.7343	1018.9978	776.4955	513.6729	337.6078	354.4044	559.7176	862.1289	1142.6564	1375.9501	(97)
Space heating kWh	448.3415	306.1958	201.2073	71.3232	15.1580	0.0000	0.0000	0.0000	0.0000	87.4195	281.5899	471.5388	(98a)
Space heating requirement - total per year (kWh/year)												1882.7739	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	448.3415	306.1958	201.2073	71.3232	15.1580	0.0000	0.0000	0.0000	0.0000	87.4195	281.5899	471.5388	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1882.7739	
Space heating per m2										(98c) / (4) =		18.8052	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	448.3415	306.1958	201.2073	71.3232	15.1580	0.0000	0.0000	0.0000	0.0000	87.4195	281.5899	471.5388	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	448.3415	306.1958	201.2073	71.3232	15.1580	0.0000	0.0000	0.0000	0.0000	87.4195	281.5899	471.5388	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	70.7939	62.4818	66.0603	57.3203	55.0478	49.0406	47.9898	50.2087	51.1066	57.6618	62.1373	69.9207	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.2030	14.6350	16.2030	15.6803	16.2030	15.6803	16.2030	16.2030	15.6803	16.2030	15.6803	16.2030	(231)
Lighting	26.3343	21.1264	19.0219	13.9363	10.7648	8.7949	9.8200	12.7644	16.5797	21.7535	24.5705	27.0662	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1882.7739	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	361.6650	
Water heating fuel used	699.7695	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	190.7774	(230a)
Total electricity for the above, kWh/year	190.7774	(231)
Electricity for lighting (calculated in Appendix L)	212.5329	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2985.8537	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1882.7739	16.4900	310.4694	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	699.7695	16.4900	115.3920	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	190.7774	16.4900	31.4592	(249)
Energy for lighting	212.5329	16.4900	35.0467	(250)
Additional standing charges			0.0000	(251)
Total energy cost			492.3673	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2214	(257)
SAP value		80.2008	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1882.7739	0.1574	296.3257	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	699.7695	0.1412	98.7988	(264)
Space and water heating			395.1245	(265)
Pumps, fans and electric keep-hot	190.7774	0.1387	26.4632	(267)
Energy for lighting	212.5329	0.1443	30.6751	(268)
Total CO2, kg/year			452.2627	(272)
CO2 emissions per m2			4.5200	(273)
EI value			95.8239	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.1200	(1b)	x 2.5500	(2b) =	255.3060	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 100.1200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		255.3060	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.5900	(17)
Infiltration rate	0.1295	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1101	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1183	0.1128	0.1128	0.1046	0.1073	0.0936	0.0936	0.0908	0.0936	0.1046	0.1018	0.1101	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000	(23c)
Effective ac	0.2583	0.2528	0.2528	0.2446	0.2473	0.2336	0.2336	0.2308	0.2336	0.2446	0.2418	0.2501	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			19.3100	1.2357	23.8622			(27)
Brickwork	94.2100	23.6500	70.5600	0.2100	14.8176	110.0000	7761.5999	(29a)
Communal Wall	7.2800	2.1500	5.1300	0.2200	1.1286	110.0000	564.3000	(29a)
Stairwell Wall	8.5100		8.5100	0.2500	2.1275	110.0000	936.1000	(29a)
Terrace Roof	51.6000		51.6000	0.1300	6.7080	9.0000	464.4000	(30)
Total net area of external elements Aum(A, m2)			161.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1933			(33)
Main dwelling								
Party Wall 1			42.5800	0.0000	0.0000	110.0000	4683.8002	(32)
Party Floor 1			100.1200			70.0000	7008.4000	(32d)
Party Ceiling 1			48.5200			30.0000	1455.6000	(32b)
Internal Wall 1			215.3200			9.0000	1937.8801	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 24812.0802	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	247.8234	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	31.8900	0.0380	1.2118
E16 Corner (normal)	16.1150	0.0540	0.8702
E17 Corner (inverted - internal area greater than external area)	6.4460	-0.0970	-0.6253
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.4200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.8800	0.0500	0.5440
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.5100	0.3300	1.4883
E15 Flat roof with parapet	27.3200	0.1500	4.0980
E25 Staggered party wall between dwellings	12.8900	0.0310	0.3996
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.3355	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 67.5288	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.7646	21.3009	21.3009	20.6054	20.8372	19.6780	19.6780	19.4461	19.6780	20.6054	20.3735	21.0691	(38)
Heat transfer coeff	89.2934	88.8297	88.8297	88.1342	88.3660	87.2068	87.2068	86.9749	87.2068	88.1342	87.9023	88.5979	(39)
Average = Sum(39)m / 12 =												88.0569	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8919	0.8872	0.8872	0.8803	0.8826	0.8710	0.8710	0.8687	0.8710	0.8803	0.8780	0.8849	(40)
HLP (average)												0.8795	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7406	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	70.1712	69.1167	67.5800	64.6399	62.4701	60.0504	58.6751	60.2001	61.8719	64.4699	67.4731	69.9024	(42a)
Hot water usage for baths	30.2991	29.8492	29.2155	28.0471	27.1722	26.2021	25.6781	26.3074	26.9925	28.0305	29.2230	30.1967	(42b)
Hot water usage for other uses	42.6968	41.1442	39.5916	38.0390	36.4864	34.9338	34.9338	36.4864	38.0390	39.5916	41.1442	42.6968	(42c)
Average daily hot water use (litres/day)												131.6029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1672	140.1100	136.3871	130.7260	126.1287	121.1864	119.2870	122.9939	126.9034	132.0920	137.8404	142.7959	(44)
Energy conte	226.7418	199.5148	209.6219	178.9573	169.7935	149.0128	144.2673	152.2922	156.4845	179.2476	196.3789	223.5839	(45)
Energy content (annual)										Total = Sum(45)m =		2185.8965	
Distribution loss (46)m = 0.15 x (45)m	34.0113	29.9272	31.4433	26.8436	25.4690	22.3519	21.6401	22.8438	23.4727	26.8871	29.4568	33.5376	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)

Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)
									Total per year (kWh/year) = Sum(64)m =			2530.8215	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	75.3917	66.3387	69.6993	59.5033	56.4563	49.5467	47.9689	50.6371	52.0311	59.5998	65.2960	74.3416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.0862	26.7223	21.7321	16.4526	12.2985	10.3829	11.2191	14.5830	19.5733	24.8528	29.0068	30.9224	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.8681	386.8411	376.8293	355.5154	328.6105	303.3237	286.4305	282.4576	292.4693	313.7832	340.6881	365.9749	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	(71)
Water heating gains (Table 5)	101.3329	98.7183	93.6818	82.6435	75.8822	68.8149	64.4743	68.0607	72.2654	80.1073	90.6888	99.9216	(72)
Total internal gains	623.2843	621.2788	601.2403	563.6086	525.7883	491.5186	471.1211	474.0984	493.3052	527.7404	569.3809	605.8160	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	23.8018	0.3300	0.0000	0.7700	26.2484	(80)
East	4.9100	23.8018	0.3100	0.0000	0.7700	27.8961	(76)
Southeast	14.4000	43.0593	0.3100	0.0000	0.7700	148.0068	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	202.1513	312.7432	450.6707	602.0640	681.9259	725.8764	689.0340	629.7858	533.5461	379.0827	241.1066	172.2121	(83)
Total gains	825.4356	934.0220	1051.9110	1165.6726	1207.7142	1217.3950	1160.1551	1103.8842	1026.8512	906.8231	810.4875	778.0281	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.1865	77.5894	77.5894	78.2017	77.9966	79.0334	79.0334	79.2440	79.0334	78.2017	78.4080	77.7925	
alpha	6.1458	6.1726	6.1726	6.2134	6.1998	6.2689	6.2689	6.2829	6.2689	6.2134	6.2272	6.1862	
util living area	0.9847	0.9669	0.9126	0.7760	0.5830	0.3720	0.2480	0.2678	0.5059	0.8248	0.9626	0.9885	(86)
MIT	20.3132	20.4835	20.7190	20.9163	20.9868	20.9993	21.0000	20.9999	20.9957	20.8986	20.5886	20.2751	(87)
Th 2	20.1744	20.1784	20.1784	20.1843	20.1823	20.1922	20.1922	20.1942	20.1922	20.1843	20.1863	20.1803	(88)
util rest of house	0.9802	0.9577	0.8911	0.7343	0.5278	0.3145	0.1873	0.2044	0.4395	0.7790	0.9506	0.9850	(89)
MIT 2	19.3947	19.6092	19.8910	20.1109	20.1734	20.1919	20.1922	20.1942	20.1900	20.0984	19.7483	19.3519	(90)
Living area fraction										fLA = Living area / (4) =		0.3022	(91)
MIT	19.6723	19.8735	20.1412	20.3543	20.4192	20.4360	20.4363	20.4377	20.4335	20.3403	20.0023	19.6309	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6723	19.8735	20.1412	20.3543	20.4192	20.4360	20.4363	20.4377	20.4335	20.3403	20.0023	19.6309	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9768	0.9537	0.8900	0.7434	0.5440	0.3319	0.2057	0.2236	0.4595	0.7884	0.9473	0.9820	(94)
Useful gains	806.2900	890.7682	936.2182	866.5411	656.9877	404.0175	238.6172	246.7932	471.8320	714.9163	767.7673	763.9974	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1301.2117	1259.0247	1131.7987	921.3816	664.4445	404.2869	238.6266	246.8089	473.8404	779.1318	1055.0287	1287.4073	(97)
Space heating kWh	368.2217	247.4684	145.5119	39.4852	5.5479	0.0000	0.0000	0.0000	0.0000	47.7764	206.8282	389.4169	(98a)
Space heating requirement - total per year (kWh/year)												1450.2566	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	368.2217	247.4684	145.5119	39.4852	5.5479	0.0000	0.0000	0.0000	0.0000	47.7764	206.8282	389.4169	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1450.2566	
Space heating per m2											(98c) / (4) =	14.4852	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

```
Space heating requirement
              368.2217   247.4684   145.5119    39.4852     5.5479     0.0000     0.0000     0.0000     0.0000    47.7764   206.8282   389.4169 (98)
Space heating efficiency (main heating system 1)
              100.0000   100.0000   100.0000   100.0000   100.0000     0.0000     0.0000     0.0000     0.0000   100.0000   100.0000   100.0000 (210)
Space heating fuel (main heating system)
              368.2217   247.4684   145.5119    39.4852     5.5479     0.0000     0.0000     0.0000     0.0000    47.7764   206.8282   389.4169 (211)
Space heating efficiency (main heating system 2)
                0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (212)
Space heating fuel (main heating system 2)
                0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (213)
Space heating fuel (secondary)
                0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (215)
Space heating fuel used, main system 2                                                                                                  0.0000 (213)

Water heating
Water heating requirement
              256.0368   225.9748   238.9169   207.3073   199.0885   177.3628   173.5623   181.5872   184.8345   208.5426   224.7289   252.8789 (64)
Efficiency of water heater                                                                                                              361.6650 (216)
(217)m        361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650   361.6650 (217)
Fuel for water heating, kWh/month
               70.7939    62.4818    66.0603    57.3203    55.0478    49.0406    47.9898    50.2087    51.1066    57.6618    62.1373    69.9207 (219)
Space cooling fuel requirement
(221)m          0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (221)
Pumps and Fa   16.2030    14.6350    16.2030    15.6803    16.2030    15.6803    16.2030    16.2030    15.6803    16.2030    15.6803    16.2030 (231)
Lighting       26.3343    21.1264    19.0219    13.9363    10.7648     8.7949     9.8200    12.7644    16.5797    21.7535    24.5705    27.0662 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m         0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m         0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m         0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m         0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m         0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m         0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m         0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m         0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1                                                                                                   1450.2566 (211)
Space heating fuel - main system 2                                                                                                      0.0000 (213)
Space heating fuel - secondary                                                                                                          0.0000 (215)
Efficiency of water heater                                                                                                            361.6650
Water heating fuel used                                                                                                              699.7695 (219)
Space cooling fuel                                                                                                                     0.0000 (221)

Electricity for pumps and fans:
    (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)
   mechanical ventilation fans (SFP =       0.6125)                                                                                   190.7774 (230a)
Total electricity for the above, kWh/year                                                                                            190.7774 (231)
Electricity for lighting (calculated in Appendix L)                                                                                  212.5329 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation                                                                                                                          0.0000 (233)
Wind generation                                                                                                                        0.0000 (234)
Hydro-electric generation (Appendix N)                                                                                                 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)                                                                                         0.0000 (235)
Appendix Q - special features
Energy saved or generated                                                                                                             -0.0000 (236)
Energy used                                                                                                                            0.0000 (237)
Total delivered energy for all uses                                                                                                 2553.3365 (238)



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10a. Fuel costs - using BEDF prices (593)
-------------------------------------------------------------------------------------------------------------
                                                                  Fuel          Fuel price           Fuel cost
                                                               kWh/year             p/kWh            £/year
Space heating - main system 1                                1450.2566           27.6700          401.2860 (240)
Space heating - main system 2                                   0.0000           27.6700            0.0000 (241)
Total CO2 associated with community systems                                                         0.0000 (473)
Water heating (other fuel)                                    699.7695           27.6700          193.6262 (247)
Energy for instantaneous electric shower(s)                     0.0000           27.6700            0.0000 (247a)
Pumps, fans and electric keep-hot                             190.7774           27.6700           52.7881 (249)
Energy for lighting                                           212.5329           27.6700           58.8079 (250)
Additional standing charges                                                                         0.0000 (251)
Total energy cost                                                                                 706.5082 (255)



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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP
-------------------------------------------------------------------------------------------------------------
                                                                  Energy  Emission factor          Emissions
                                                               kWh/year       kg CO2/kWh       kg CO2/year
Space heating - main system 1                                1450.2566           0.1582          229.4607 (261)
Space heating - main system 2                                   0.0000           0.0000            0.0000 (262)
Total CO2 associated with community systems                                                         0.0000 (373)
Water heating (other fuel)                                    699.7695           0.1412           98.7988 (264)
Space and water heating                                                                           328.2595 (265)
Pumps, fans and electric keep-hot                             190.7774           0.1387           26.4632 (267)
Energy for lighting                                           212.5329           0.1443           30.6751 (268)
Total CO2, kg/year                                                                                385.3977 (272)



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13a. Primary energy - Individual heating systems including micro-CHP
-------------------------------------------------------------------------------------------------------------
                                                                  Energy Primary energy factor  Primary energy
                                                               kWh/year       kg CO2/kWh       kWh/year
Space heating - main system 1                                1450.2566           1.5857         2299.6519 (275)
Space heating - main system 2                                   0.0000           0.0000            0.0000 (276)
Total CO2 associated with community systems                                                         0.0000 (473)
Water heating (other fuel)                                    699.7695           1.5221         1065.1015 (278)
Space and water heating                                                                          3364.7534 (279)
Pumps, fans and electric keep-hot                             190.7774           1.5128          288.6081 (281)
```

Energy for lighting	212.5329	1.5338	325.9901 (282)
Total Primary energy kWh/year			3979.3515 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 80
Current environmental impact rating: A 96

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 80
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£707	£707	£0
Space heating	£454	£454	£0
Water heating	£194	£194	£0
Lighting	£59	£59	£0
Total cost of fuels	£707	£707	£0
Total cost of uses	£707	£707	£0
Delivered energy	26 kWh/m²	26 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	40 kWh/m²	40 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.1200	(1b)	x 2.5500	(2b)	= 255.3060	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.1200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 255.3060	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5900 (17)
Infiltration rate		0.1295 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1101 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1403	0.1376	0.1348	0.1211	0.1183	0.1046	0.1046	0.1018	0.1101	0.1183	0.1238	0.1293	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.0000 (23c)

Effective ac	0.2803	0.2776	0.2748	0.2611	0.2583	0.2446	0.2446	0.2418	0.2501	0.2583	0.2638	0.2693 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			19.3100	1.2357	23.8622			(27)
Brickwork	94.2100	23.6500	70.5600	0.2100	14.8176	110.0000	7761.5999	(29a)
Communal Wall	7.2800	2.1500	5.1300	0.2200	1.1286	110.0000	564.3000	(29a)
Stairwell Wall	8.5100		8.5100	0.2500	2.1275	110.0000	936.1000	(29a)
Terrace Roof	51.6000		51.6000	0.1300	6.7080	9.0000	464.4000	(30)
Total net area of external elements Aum(A, m2)			161.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1933			(33)
Main dwelling								
Party Wall 1			42.5800	0.0000	0.0000	110.0000	4683.8002	(32)
Party Floor 1			100.1200			70.0000	7008.4000	(32d)
Party Ceiling 1			48.5200			30.0000	1455.6000	(32b)
Internal Wall 1			215.3200			9.0000	1937.8801	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24812.0802 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 247.8234 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	31.8900	0.0380	1.2118
E16 Corner (normal)	16.1150	0.0540	0.8702
E17 Corner (inverted - internal area greater than external area)	6.4460	-0.0970	-0.6253
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.4200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.8800	0.0500	0.5440
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.5100	0.3300	1.4883
E15 Flat roof with parapet	27.3200	0.1500	4.0980
E25 Staggered party wall between dwellings	12.8900	0.0310	0.3996
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.3355 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 67.5288 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.6194	23.3875	23.1557	21.9965	21.7646	20.6054	20.6054	20.3735	21.0691	21.7646	22.2283	22.6920	(38)
Heat transfer coeff	91.1482	90.9163	90.6845	89.5252	89.2934	88.1342	88.1342	87.9023	88.5979	89.2934	89.7571	90.2208	(39)

Average = Sum(39)m / 12 = 89.4673

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9104	0.9081	0.9058	0.8942	0.8919	0.8803	0.8803	0.8780	0.8849	0.8919	0.8965	0.9011	(40)
HLP (average)												0.8936	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7406 (42)
Hot water usage for mixer showers

70.1712	69.1167	67.5800	64.6399	62.4701	60.0504	58.6751	60.2001	61.8719	64.4699	67.4731	69.9024	(42a)

Hot water usage for baths

30.2991	29.8492	29.2155	28.0471	27.1722	26.2021	25.6781	26.3074	26.9925	28.0305	29.2230	30.1967	(42b)

Hot water usage for other uses

42.6968	41.1442	39.5916	38.0390	36.4864	34.9338	34.9338	36.4864	38.0390	39.5916	41.1442	42.6968	(42c)

Average daily hot water use (litres/day) 131.6029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1672	140.1100	136.3871	130.7260	126.1287	121.1864	119.2870	122.9939	126.9034	132.0920	137.8404	142.7959	(44)
Energy conte	226.7418	199.5148	209.6219	178.9573	169.7935	149.0128	144.2673	152.2922	156.4845	179.2476	196.3789	223.5839	(45)

Energy content (annual) Total = Sum(45)m = 2185.8965
Distribution loss (46)m = 0.15 x (45)m

34.0113	29.9272	31.4433	26.8436	25.4690	22.3519	21.6401	22.8438	23.4727	26.8871	29.4568	33.5376	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)

Total per year (kWh/year) = Sum(64)m = 2530.8215 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

75.3917	66.3387	69.6993	59.5033	56.4563	49.5467	47.9689	50.6371	52.0311	59.5998	65.2960	74.3416	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	30.0862	26.7223	21.7321	16.4526	12.2985	10.3829	11.2191	14.5830	19.5733	24.8528	29.0068	30.9224	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	382.8681	386.8411	376.8293	355.5154	328.6105	303.3237	286.4305	282.4576	292.4693	313.7832	340.6881	365.9749	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	(71)

Water heating gains (Table 5)

	101.3329	98.7183	93.6818	82.6435	75.8822	68.8149	64.4743	68.0607	72.2654	80.1073	90.6888	99.9216	(72)

Total internal gains

	623.2843	621.2788	601.2403	563.6086	525.7883	491.5186	471.1211	474.0984	493.3052	527.7404	569.3809	605.8160	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	19.6403	0.3300	0.0000	0.7700	21.6592	(80)
East	4.9100	19.6403	0.3100	0.0000	0.7700	23.0187	(76)
Southeast	14.4000	36.7938	0.3100	0.0000	0.7700	126.4707	(77)

Solar gains	171.1486	302.8258	438.6902	575.1365	666.3377	669.4710	642.2638	574.1889	486.5599	341.7988	207.1908	144.9735	(83)
Total gains	794.4329	924.1046	1039.9305	1138.7451	1192.1260	1160.9896	1113.3849	1048.2873	979.8650	869.5392	776.5717	750.7895	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6158	75.8086	76.0025	76.9866	77.1865	78.2017	78.2017	78.4080	77.7925	77.1865	76.7877	76.3931	
alpha	6.0411	6.0539	6.0668	6.1324	6.1458	6.2134	6.2134	6.2272	6.1862	6.1458	6.1192	6.0929	
util living area	0.9905	0.9763	0.9378	0.8374	0.6718	0.4830	0.3480	0.3851	0.6108	0.8867	0.9785	0.9930	(86)
MIT	20.1708	20.3665	20.6166	20.8534	20.9666	20.9963	20.9996	20.9993	20.9854	20.8216	20.4485	20.1299	(87)
Th 2	20.1587	20.1606	20.1626	20.1725	20.1744	20.1843	20.1843	20.1863	20.1803	20.1744	20.1705	20.1665	(88)
util rest of house	0.9877	0.9698	0.9218	0.8030	0.6200	0.4227	0.2836	0.3173	0.5436	0.8527	0.9714	0.9909	(89)
MIT 2	19.2025	19.4494	19.7565	20.0349	20.1489	20.1823	20.1842	20.1860	20.1715	20.0096	19.5629	19.1568	(90)
Living area fraction									fLA = Living area / (4) =			0.3022	(91)
MIT	19.4951	19.7266	20.0165	20.2822	20.3960	20.4283	20.4306	20.4318	20.4175	20.2550	19.8305	19.4509	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4951	19.7266	20.0165	20.2822	20.3960	20.4283	20.4306	20.4318	20.4175	20.2550	19.8305	19.4509	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9849	0.9656	0.9186	0.8079	0.6343	0.4409	0.3031	0.3378	0.5634	0.8563	0.9678	0.9885	(94)
Useful gains	782.4004	892.3320	955.2945	919.9378	756.1219	511.8626	337.4661	354.1305	552.0690	744.6296	751.5594	742.1613	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1385.0100	1347.9804	1225.7343	1018.9978	776.4955	513.6729	337.6078	354.4044	559.7176	862.1289	1142.6564	1375.9501	(97)
Space heating kWh	448.3415	306.1958	201.2073	71.3232	15.1580	0.0000	0.0000	0.0000	0.0000	87.4195	281.5899	471.5388	(98a)
Space heating requirement - total per year (kWh/year)												1882.7739	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	448.3415	306.1958	201.2073	71.3232	15.1580	0.0000	0.0000	0.0000	0.0000	87.4195	281.5899	471.5388	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1882.7739	
Space heating per m2										(98c) / (4) =		18.8052	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	448.3415	306.1958	201.2073	71.3232	15.1580	0.0000	0.0000	0.0000	0.0000	87.4195	281.5899	471.5388	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	448.3415	306.1958	201.2073	71.3232	15.1580	0.0000	0.0000	0.0000	0.0000	87.4195	281.5899	471.5388	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating

Water heating requirement

	256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	70.7939	62.4818	66.0603	57.3203	55.0478	49.0406	47.9898	50.2087	51.1066	57.6618	62.1373	69.9207	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.2030	14.6350	16.2030	15.6803	16.2030	15.6803	16.2030	16.2030	15.6803	16.2030	15.6803	16.2030	(231)
Lighting	26.3343	21.1264	19.0219	13.9363	10.7648	8.7949	9.8200	12.7644	16.5797	21.7535	24.5705	27.0662	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1882.7739	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	699.7695	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)		
mechanical ventilation fans (SFP = 0.6125)	190.7774	(230a)
Total electricity for the above, kWh/year	190.7774	(231)
Electricity for lighting (calculated in Appendix L)	212.5329	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2985.8537	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1882.7739	16.4900	310.4694	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	699.7695	16.4900	115.3920	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	190.7774	16.4900	31.4592	(249)
Energy for lighting	212.5329	16.4900	35.0467	(250)
Additional standing charges			0.0000	(251)
Total energy cost			492.3673	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2214	(257)
SAP value		80.2008	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1882.7739	0.1574	296.3257	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	699.7695	0.1412	98.7988	(264)
Space and water heating			395.1245	(265)
Pumps, fans and electric keep-hot	190.7774	0.1387	26.4632	(267)
Energy for lighting	212.5329	0.1443	30.6751	(268)
Total CO2, kg/year			452.2627	(272)
CO2 emissions per m2			4.5200	(273)
EI value			95.8239	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	100.1200	(1b)	x 2.5500	(2b) =	255.3060	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.1200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		255.3060	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5900	(17)
Infiltration rate		0.1295	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1101	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1183	0.1128	0.1128	0.1046	0.1073	0.0936	0.0936	0.0908	0.0936	0.1046	0.1018	0.1101	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2583	0.2528	0.2528	0.2446	0.2473	0.2336	0.2336	0.2308	0.2336	0.2446	0.2418	0.2501	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Window			4.3400	1.1450	4.9695			(27)
Window-Red			19.3100	1.2357	23.8622			(27)
Brickwork	94.2100	23.6500	70.5600	0.2100	14.8176	110.0000	7761.5999	(29a)
Communal Wall	7.2800	2.1500	5.1300	0.2200	1.1286	110.0000	564.3000	(29a)
Stairwell Wall	8.5100		8.5100	0.2500	2.1275	110.0000	936.1000	(29a)
Terrace Roof	51.6000		51.6000	0.1300	6.7080	9.0000	464.4000	(30)
Total net area of external elements Aum(A, m2)			161.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1933			(33)
Main dwelling								
Party Wall 1			42.5800	0.0000	0.0000	110.0000	4683.8002	(32)
Party Floor 1			100.1200			70.0000	7008.4000	(32d)
Party Ceiling 1			48.5200			30.0000	1455.6000	(32b)
Internal Wall 1			215.3200			9.0000	1937.8801	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 24812.0802	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	247.8234	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	31.8900	0.0380	1.2118
E16 Corner (normal)	16.1150	0.0540	0.8702
E17 Corner (inverted - internal area greater than external area)	6.4460	-0.0970	-0.6253
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	26.4200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.8800	0.0500	0.5440
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.5100	0.3300	1.4883
E15 Flat roof with parapet	27.3200	0.1500	4.0980
E25 Staggered party wall between dwellings	12.8900	0.0310	0.3996
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.3355 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	67.5288 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.7646	21.3009	21.3009	20.6054	20.8372	19.6780	19.6780	19.4461	19.6780	20.6054	20.3735	21.0691	(38)
Heat transfer coeff	89.2934	88.8297	88.8297	88.1342	88.3660	87.2068	87.2068	86.9749	87.2068	88.1342	87.9023	88.5979	(39)
Average = Sum(39)m / 12 =												88.0569	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8919	0.8872	0.8872	0.8803	0.8826	0.8710	0.8710	0.8687	0.8710	0.8803	0.8780	0.8849	(40)
HLP (average)												0.8795	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7406	(42)
Hot water usage for mixer showers		

	70.1712	69.1167	67.5800	64.6399	62.4701	60.0504	58.6751	60.2001	61.8719	64.4699	67.4731	69.9024	(42a)
Hot water usage for baths													
	30.2991	29.8492	29.2155	28.0471	27.1722	26.2021	25.6781	26.3074	26.9925	28.0305	29.2230	30.1967	(42b)
Hot water usage for other uses													
	42.6968	41.1442	39.5916	38.0390	36.4864	34.9338	34.9338	36.4864	38.0390	39.5916	41.1442	42.6968	(42c)
Average daily hot water use (litres/day)												131.6029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.1672	140.1100	136.3871	130.7260	126.1287	121.1864	119.2870	122.9939	126.9034	132.0920	137.8404	142.7959	(44)
Energy conte	226.7418	199.5148	209.6219	178.9573	169.7935	149.0128	144.2673	152.2922	156.4845	179.2476	196.3789	223.5839	(45)
Energy content (annual)										Total = Sum(45)m =		2185.8965	
Distribution loss (46)m = 0.15 x (45)m													
	34.0113	29.9272	31.4433	26.8436	25.4690	22.3519	21.6401	22.8438	23.4727	26.8871	29.4568	33.5376	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)
										Total per year (kWh/year) = Sum(64)m =		2530.8215	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	75.3917	66.3387	69.6993	59.5033	56.4563	49.5467	47.9689	50.6371	52.0311	59.5998	65.2960	74.3416	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	164.4380	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.0862	26.7223	21.7321	16.4526	12.2985	10.3829	11.2191	14.5830	19.5733	24.8528	29.0068	30.9224	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	382.8681	386.8411	376.8293	355.5154	328.6105	303.3237	286.4305	282.4576	292.4693	313.7832	340.6881	365.9749	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	54.1844	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	-109.6254	(71)
Water heating gains (Table 5)													
	101.3329	98.7183	93.6818	82.6435	75.8822	68.8149	64.4743	68.0607	72.2654	80.1073	90.6888	99.9216	(72)
Total internal gains													
	623.2843	621.2788	601.2403	563.6086	525.7883	491.5186	471.1211	474.0984	493.3052	527.7404	569.3809	605.8160	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	4.3400	23.8018	0.3300	0.0000	0.7700	26.2484	(80)
East	4.9100	23.8018	0.3100	0.0000	0.7700	27.8961	(76)
Southeast	14.4000	43.0593	0.3100	0.0000	0.7700	148.0068	(77)

Solar gains	202.1513	312.7432	450.6707	602.0640	681.9259	725.8764	689.0340	629.7858	533.5461	379.0827	241.1066	172.2121	(83)
Total gains	825.4356	934.0220	1051.9110	1165.6726	1207.7142	1217.3950	1160.1551	1103.8842	1026.8512	906.8231	810.4875	778.0281	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.1865	77.5894	77.5894	78.2017	77.9966	79.0334	79.0334	79.2440	79.0334	78.2017	78.4080	77.7925	
alpha	6.1458	6.1726	6.1726	6.2134	6.1998	6.2689	6.2689	6.2829	6.2689	6.2134	6.2272	6.1862	
util living area													
	0.9847	0.9669	0.9126	0.7760	0.5830	0.3720	0.2480	0.2678	0.5059	0.8248	0.9626	0.9885	(86)
MIT	20.3132	20.4835	20.7190	20.9163	20.9868	20.9993	21.0000	20.9999	20.9957	20.8986	20.5886	20.2751	(87)
Th 2	20.1744	20.1784	20.1784	20.1843	20.1823	20.1922	20.1922	20.1942	20.1922	20.1843	20.1863	20.1803	(88)
util rest of house													
	0.9802	0.9577	0.8911	0.7343	0.5278	0.3145	0.1873	0.2044	0.4395	0.7790	0.9506	0.9850	(89)
MIT 2	19.3947	19.6092	19.8910	20.1109	20.1734	20.1919	20.1922	20.1942	20.1900	20.0984	19.7483	19.3519	(90)
Living area fraction										fLA = Living area / (4) =		0.3022	(91)
MIT	19.6723	19.8735	20.1412	20.3543	20.4192	20.4360	20.4363	20.4377	20.4335	20.3403	20.0023	19.6309	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6723	19.8735	20.1412	20.3543	20.4192	20.4360	20.4363	20.4377	20.4335	20.3403	20.0023	19.6309	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9768	0.9537	0.8900	0.7434	0.5440	0.3319	0.2057	0.2236	0.4595	0.7884	0.9473	0.9820	(94)
Useful gains	806.2900	890.7682	936.2182	866.5411	656.9877	404.0175	238.6172	246.7932	471.8320	714.9163	767.7673	763.9974	(95)

Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1301.2117	1259.0247	1131.7987	921.3816	664.4445	404.2869	238.6266	246.8089	473.8404	779.1318	1055.0287	1287.4073	(97)
Space heating kWh	368.2217	247.4684	145.5119	39.4852	5.5479	0.0000	0.0000	0.0000	0.0000	47.7764	206.8282	389.4169	(98a)
Space heating requirement - total per year (kWh/year)												1450.2566	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	368.2217	247.4684	145.5119	39.4852	5.5479	0.0000	0.0000	0.0000	0.0000	47.7764	206.8282	389.4169	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1450.2566	
Space heating per m2											(98c) / (4) =	14.4852	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	368.2217	247.4684	145.5119	39.4852	5.5479	0.0000	0.0000	0.0000	0.0000	47.7764	206.8282	389.4169	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	368.2217	247.4684	145.5119	39.4852	5.5479	0.0000	0.0000	0.0000	0.0000	47.7764	206.8282	389.4169	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	256.0368	225.9748	238.9169	207.3073	199.0885	177.3628	173.5623	181.5872	184.8345	208.5426	224.7289	252.8789	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	70.7939	62.4818	66.0603	57.3203	55.0478	49.0406	47.9898	50.2087	51.1066	57.6618	62.1373	69.9207	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.2030	14.6350	16.2030	15.6803	16.2030	15.6803	16.2030	16.2030	15.6803	16.2030	15.6803	16.2030	(231)
Lighting	26.3343	21.1264	19.0219	13.9363	10.7648	8.7949	9.8200	12.7644	16.5797	21.7535	24.5705	27.0662	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1450.2566	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												699.7695	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6125)													
mechanical ventilation fans (SFP = 0.6125)												190.7774	(230a)
Total electricity for the above, kWh/year												190.7774	(231)
Electricity for lighting (calculated in Appendix L)												212.5329	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2553.3365	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1450.2566	27.6700	401.2860	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	699.7695	27.6700	193.6262	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	190.7774	27.6700	52.7881	(249)
Energy for lighting	212.5329	27.6700	58.8079	(250)
Additional standing charges			0.0000	(251)
Total energy cost			706.5082	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1450.2566	0.1582	229.4607	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	699.7695	0.1412	98.7988	(264)
Space and water heating			328.2595	(265)
Pumps, fans and electric keep-hot	190.7774	0.1387	26.4632	(267)
Energy for lighting	212.5329	0.1443	30.6751	(268)
Total CO2, kg/year			385.3977	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1450.2566	1.5857	2299.6519	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	699.7695	1.5221	1065.1015	(278)
Space and water heating			3364.7534	(279)
Pumps, fans and electric keep-hot	190.7774	1.5128	288.6081	(281)
Energy for lighting	212.5329	1.5338	325.9901	(282)
Total Primary energy kWh/year			3979.3515	(286)

Summary for Input Data

Plot Reference	P-28	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-28
Plot Address	Flat 8, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	87 B	**DER**	4.25	**TER**	13.77
Environmental	97 A	**% DER < TER**			69.14
CO_2 Emissions (t/year)	0.17	**DFEE**	30.34	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			1.94
% DPER < TPER	39.75	**DPER**	44.17	**TPER**	73.31

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	287.45	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	16.77 m	51.65 m²	2.55 m

8.0 Living Area	25.47	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	45.78	34.91	0.00	None	10.87	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	7.53	5.47	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	38.27	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	114.37

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	51.65

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)

Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted		70.00	51.65

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	East	2.06	
Patio Door	Patio Door	Brickwork	West	5.42	
West	Window	Brickwork	West	2.72	
South	Window	Brickwork	South	2.72	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	29.21	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	6.36	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	24.08	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.30	0.33	0.33	Abbey Calculated	No
E2 Other lintels (including other steel lintels)	Independently assessed	5.54	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	18.49	0.02	0.02	RCD	No
E16 Corner (normal)	Gov Approved Scheme	3.18	0.05	0.05	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	3.18	0.03	0.03	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.85	-0.10	-0.10	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value	0.11	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0

Summary for Input Data

Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.86	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

Summary for Input Data

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-28	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-28
Plot Address	Flat 8, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	87 B	**DER**	4.25	**TER**	13.77
Environmental	97 A	**% DER < TER**			69.14
CO_2 Emissions (t/year)	0.17	**DFEE**	30.34	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			1.94
% DPER < TPER	39.75	**DPER**	44.17	**TPER**	73.31

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	131.7075	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8600	(17)
Infiltration rate		0.1430	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1215	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1550	0.1519	0.1489	0.1337	0.1307	0.1155	0.1155	0.1124	0.1215	0.1307	0.1367	0.1428	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2910	0.2879	0.2849	0.2697	0.2667	0.2515	0.2515	0.2484	0.2576	0.2667	0.2727	0.2788	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	45.7800	10.8600	34.9200	0.2100	7.3332	110.0000	3841.1999	(29a)
Communal Wall	7.5300	2.0600	5.4700	0.2200	1.2034	110.0000	601.7000	(29a)
Total net area of external elements Aum(A, m2)			53.3100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4437			(33)
Main dwelling								
Party Wall 1			38.2700	0.0000	0.0000	110.0000	4209.7001	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			114.3700			9.0000	1029.3300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14846.9300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.4527	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.2100	0.0380	1.1100
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	3.1800	0.0540	0.1717
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0814 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.5251 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.6468	12.5148	12.3827	11.7223	11.5902	10.9299	10.9299	10.7978	11.1940	11.5902	11.8544	12.1185	(38)
Heat transfer coeff	42.1719	42.0398	41.9078	41.2474	41.1153	40.4549	40.4549	40.3229	40.7191	41.1153	41.3795	41.6436	(39)
Average = Sum(39)m / 12 =												41.2144	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8165	0.8139	0.8114	0.7986	0.7960	0.7833	0.7833	0.7807	0.7884	0.7960	0.8012	0.8063	(40)
HLP (average)												0.7980	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)
Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
										Total per year (kWh/year) = Sum(64)m =		2007.3944	(64)
12Total per year (kWh/year)												2007	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains	354.2931	362.0874	346.0852	331.8094	313.4656	300.6378	288.0966	289.2516	298.9655	310.8102	332.0596	346.5342	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
West	2.7200	19.6403	0.3300	0.0000	0.7700	13.5744	(80)

Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	427.2292	494.4754	544.3684	598.8678	626.7770	616.4998	590.7218	557.5747	521.5941	462.1848	421.0139	407.8622	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	97.7937	98.1010	98.4101	99.9857	100.3069	101.9442	101.9442	102.2781	101.2829	100.3069	99.6665	99.0343	
alpha	7.5196	7.5401	7.5607	7.6657	7.6871	7.7963	7.7963	7.8185	7.7522	7.6871	7.6444	7.6023	
util living area	0.9907	0.9729	0.9257	0.7901	0.6047	0.4197	0.3013	0.3326	0.5366	0.8477	0.9735	0.9930	(86)
MIT	20.4486	20.6157	20.7962	20.9490	20.9933	20.9997	21.0000	21.0000	20.9979	20.9294	20.6748	20.4209	(87)
Th 2	20.2391	20.2413	20.2435	20.2546	20.2568	20.2679	20.2679	20.2701	20.2634	20.2568	20.2523	20.2479	(88)
util rest of house	0.9877	0.9649	0.9065	0.7527	0.5584	0.3718	0.2512	0.2799	0.4803	0.8077	0.9643	0.9907	(89)
MIT 2	19.6090	19.8185	20.0356	20.2101	20.2521	20.2677	20.2679	20.2701	20.2623	20.1968	19.9033	19.5815	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	20.0230	20.2116	20.4107	20.5745	20.6176	20.6287	20.6289	20.6300	20.6250	20.5581	20.2837	19.9954	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0230	20.2116	20.4107	20.5745	20.6176	20.6287	20.6289	20.6300	20.6250	20.5581	20.2837	19.9954	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9866	0.9645	0.9111	0.7692	0.5810	0.3954	0.2759	0.3059	0.5080	0.8247	0.9648	0.9898	(94)
Useful gains	421.5193	476.9393	495.9736	460.6516	364.1601	243.7819	162.9833	170.5545	264.9929	381.1557	406.1747	403.6990	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	663.0702	643.6974	582.9659	481.5418	366.6515	243.8887	162.9885	170.5658	265.6932	409.4289	545.5360	657.7785	(97)
Space heating kWh	179.7139	112.0614	64.7222	15.0409	1.8536	0.0000	0.0000	0.0000	0.0000	21.0353	100.3401	189.0352	(98a)
Space heating requirement - total per year (kWh/year)												683.8026	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	179.7139	112.0614	64.7222	15.0409	1.8536	0.0000	0.0000	0.0000	0.0000	21.0353	100.3401	189.0352	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												683.8026	
Space heating per m2											(98c) / (4) =	13.2392	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	179.7139	112.0614	64.7222	15.0409	1.8536	0.0000	0.0000	0.0000	0.0000	21.0353	100.3401	189.0352	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	179.7139	112.0614	64.7222	15.0409	1.8536	0.0000	0.0000	0.0000	0.0000	21.0353	100.3401	189.0352	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												683.8026	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.4014	(230a)
Total electricity for the above, kWh/year	94.4014	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1469.4836	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	683.8026	0.1584	108.3461	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			186.6547	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			219.4125	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	683.8026	1.5865	1084.8482	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)
Space and water heating			1929.4524	(279)
Pumps, fans and electric keep-hot	94.4014	1.5128	142.8104	(281)
Energy for lighting	136.2372	1.5338	208.9651	(282)
Total Primary energy kWh/year			2281.2279	(286)
Dwelling Primary energy Rate (DPER)			44.1700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.7075	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1519	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4019	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3416	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4355	0.4270	0.4184	0.3757	0.3672	0.3245	0.3245	0.3160	0.3416	0.3672	0.3843	0.4013	(22b)
Effective ac	0.5948	0.5912	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8600	1.1450	12.4351			(27)
Brickwork	45.7800	10.8600	34.9200	0.1800	6.2856			(29a)
Communal Wall	7.5300	2.0600	5.4700	0.1800	0.9846			(29a)
Total net area of external elements Aum(A, m2)			53.3100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.7653			(33)
Main dwelling								
Party Wall 1			38.2700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 287.4527 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.2100	0.0700	2.0447
E18 Party wall between dwellings	6.3600	0.0600	0.3816
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0500	0.9245
E16 Corner (normal)	3.1800	0.0900	0.2862
E25 Staggered party wall between dwellings	3.1800	0.0600	0.1908
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8543 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.6196 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.8535	25.6935	25.5366	24.7997	24.6618	24.0200	24.0200	23.9012	24.2672	24.6618	24.9407	25.2323	(38)
Heat transfer coeff	55.4731	55.3131	55.1562	54.4193	54.2814	53.6396	53.6396	53.5208	53.8869	54.2814	54.5603	54.8519	(39)

Average = Sum(39)m / 12 = 54.4186

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0740	1.0709	1.0679	1.0536	1.0509	1.0385	1.0385	1.0362	1.0433	1.0509	1.0563	1.0620	(40)
HLP (average)												1.0536	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	219.0409	193.8256	206.0225	181.1975	175.7315	158.4238	156.3170	162.4195	164.1044	182.9195	194.4456	216.6389	(62)
WWHRS	-24.3997	-21.5793	-22.5966	-18.7109	-17.4379	-14.9217	-13.9867	-14.8735	-15.4386	-18.2004	-20.6188	-23.9478	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
										Total per year (kWh/year) = Sum(64)m =		1984.3750	(64)
12Total per year (kWh/year)												1984	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	94.6142	84.1221	90.2856	81.3286	80.2138	73.7564	73.7585	75.7876	75.6451	82.6039	85.7336	93.8156	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)												
	127.1696	125.1817	121.3516	112.9564	107.8143	102.4394	99.1378	101.8651	105.0627	111.0267	119.0744	126.0962 (72)
Total internal gains												
	407.3951	415.1894	399.1873	384.9114	366.5676	350.7398	338.1986	339.3536	349.0676	363.9122	385.1616	399.6363 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.7200	46.7521	0.6300	0.7000	0.7700	38.8635	(78)
West	8.1400	19.6403	0.6300	0.7000	0.7700	48.8589	(80)

Solar gains	87.7223	159.2267	238.4806	321.1985	376.8282	379.8959	363.9756	322.7195	267.7615	182.0625	106.9877	73.7608 (83)
Total gains	495.1174	574.4161	637.6679	706.1099	743.3958	730.6357	702.1742	662.0732	616.8290	545.9747	492.1494	473.3971 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.3450	74.5601	74.7722	75.7846	75.9771	76.8862	76.8862	77.0569	76.5335	75.9771	75.5887	75.1869
alpha	5.9563	5.9707	5.9848	6.0523	6.0651	6.1257	6.1257	6.1371	6.1022	6.0651	6.0392	6.0125
util living area												
	0.9887	0.9728	0.9342	0.8266	0.6568	0.4674	0.3358	0.3713	0.5916	0.8724	0.9729	0.9911 (86)
MIT	20.1791	20.3764	20.6162	20.8589	20.9688	20.9966	20.9996	20.9993	20.9869	20.8336	20.4732	20.1484 (87)
Th 2	20.0221	20.0247	20.0271	20.0389	20.0411	20.0514	20.0514	20.0533	20.0474	20.0411	20.0366	20.0320 (88)
util rest of house												
	0.9849	0.9642	0.9148	0.7853	0.5969	0.3993	0.2636	0.2952	0.5149	0.8299	0.9628	0.9880 (89)
MIT 2	19.0950	19.3426	19.6343	19.9139	20.0193	20.0498	20.0513	20.0531	20.0405	19.8974	19.4756	19.0640 (90)
Living area fraction									fLA = Living area / (4) =			0.4931 (91)
MIT	19.6296	19.8524	20.1185	20.3799	20.4875	20.5167	20.5189	20.5197	20.5072	20.3591	19.9676	19.5987 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6296	19.8524	20.1185	20.3799	20.4875	20.5167	20.5189	20.5197	20.5072	20.3591	19.9676	19.5987 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9829	0.9624	0.9168	0.8007	0.6253	0.4329	0.2992	0.3328	0.5525	0.8452	0.9619	0.9862	(94)
Useful gains	486.6710	552.8081	584.6222	565.3966	464.8811	316.2810	210.1187	220.3167	340.7853	461.4445	473.3901	466.8817	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	850.3820	827.0625	751.1445	624.7277	476.9972	317.3696	210.2098	220.4893	345.2637	529.7358	702.0583	844.6492	(97)
Space heating kWh													
	270.6010	184.2989	123.8926	42.7184	9.0144	0.0000	0.0000	0.0000	0.0000	50.8087	164.6411	281.0590	(98a)
Space heating requirement - total per year (kWh/year)												1127.0342	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	270.6010	184.2989	123.8926	42.7184	9.0144	0.0000	0.0000	0.0000	0.0000	50.8087	164.6411	281.0590	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1127.0342	
Space heating per m2											(98c) / (4) =	21.8206	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	270.6010	184.2989	123.8926	42.7184	9.0144	0.0000	0.0000	0.0000	0.0000	50.8087	164.6411	281.0590	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	293.1755	199.6738	134.2282	46.2821	9.7665	0.0000	0.0000	0.0000	0.0000	55.0474	178.3761	304.5059	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7988	84.2117	83.1994	81.5200	80.2382	79.8000	79.8000	79.8000	79.8000	81.7533	83.9382	84.9052	(217)
Fuel for water heating, kWh/month													
	229.5328	204.5395	220.4654	199.3213	197.2797	179.8273	178.3588	184.8948	186.2980	201.4832	207.0891	226.9485	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9214	12.7728	11.5005	8.4257	6.5083	5.3173	5.9371	7.7172	10.0239	13.1519	14.8551	16.3640	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.9766	-20.7826	-31.4959	-37.4135	-42.1278	-39.9999	-39.5329	-36.4411	-31.2895	-24.6504	-15.7505	-11.9625	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9299	-10.6083	-21.5278	-32.9858	-44.2484	-44.6716	-44.1257	-37.0541	-26.7727	-15.3613	-6.6443	-3.8795	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1221.0555	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2416.0383	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.4952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-638.2327	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3213.3562	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1221.0555	0.2100	256.4217	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2416.0383	0.2100	507.3680	(264)
Space and water heating			763.7897	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.4952	0.1443	18.5458	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	0.1335	-46.1008	
PV Unit electricity exported	-292.8094	0.1253	-36.6969	
Total			-82.7977	(269)
Total CO2, kg/year			711.4671	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1221.0555	1.1300	1379.7927	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2416.0383	1.1300	2730.1232	(278)
Space and water heating			4109.9159	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.4952	1.5338	197.0902	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	1.4932	-515.7819	
PV Unit electricity exported	-292.8094	0.4600	-134.6951	
Total			-650.4770	(283)
Total Primary energy kWh/year			3786.6299	(286)
Target Primary Energy Rate (TPER)			73.3100	(287)

Full SAP Calculation Printout

Plot Reference	P-28	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-28
Plot Address	Flat 8, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	87 B	**DER**	4.25	**TER**	13.77
Environmental	97 A	**% DER < TER**			69.14
CO_2 Emissions (t/year)	0.17	**DFEE**	30.34	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			1.94
% DPER < TPER	39.75	**DPER**	44.17	**TPER**	73.31

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.7075	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1519	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8600	(17)
Infiltration rate		0.2949	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2506	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3195	0.3133	0.3070	0.2757	0.2694	0.2381	0.2381	0.2318	0.2506	0.2694	0.2820	0.2945	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5511	0.5491	0.5471	0.5380	0.5363	0.5283	0.5283	0.5269	0.5314	0.5363	0.5397	0.5434	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	45.7800	10.8600	34.9200	0.2100	7.3332	110.0000	3841.1999	(29a)
Communal Wall	7.5300	2.0600	5.4700	0.2200	1.2034	110.0000	601.7000	(29a)
Total net area of external elements Aum(A, m2)			53.3100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4437			(33)
Main dwelling								
Party Wall 1			38.2700	0.0000	0.0000	110.0000	4209.7001	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			114.3700			9.0000	1029.3300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14846.9300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.4527	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	29.2100	0.0380	1.1100

E18 Party wall between dwellings	6.3600	0.0380	0.2417	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.0800	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190	
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770	
E4 Jamb	18.4900	0.0160	0.2958	
E16 Corner (normal)	3.1800	0.0540	0.1717	
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0814 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.5251 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.9508	23.8646	23.7801	23.3834	23.3092	22.9637	22.9637	22.8997	23.0968	23.3092	23.4593	23.6163	(38)
Heat transfer coeff	53.4758	53.3896	53.3052	52.9085	52.8343	52.4887	52.4887	52.4247	52.6218	52.8343	52.9844	53.1414	(39)

Average = Sum(39)m / 12 = 52.9081

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0353	1.0337	1.0320	1.0244	1.0229	1.0162	1.0162	1.0150	1.0188	1.0229	1.0258	1.0289	(40)
HLP (average)												1.0244	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 50.8820 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5117	53.9894	52.3273	50.2580	48.4122	46.4939	46.0949	47.7536	49.4549	51.4249	53.5126	55.4336	(44)
Energy conte	87.9169	76.8803	80.4252	68.8007	65.1722	57.1697	55.7477	59.1289	60.9828	69.7831	76.2385	86.7957	(45)

Energy content (annual) Total = Sum(45)m = 845.0417

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(64)

Total per year (kWh/year) = Sum(64)m = 718.2855 (64)

12Total per year (kWh/year) 718 (64)

Electric shower(s)

42.7425	38.0839	41.5862	39.6852	40.4299	38.5662	39.8517	40.4299	39.6852	41.5862	40.8042	42.7425	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 486.1935 (64a)

Heat gains from water heating, kWh/month

29.3680	25.8580	27.4869	24.5415	23.9566	21.7901	21.8093	22.6724	22.8801	25.2255	26.4017	29.1297	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	39.4731	38.4792	36.9448	34.0854	32.1997	30.2640	29.3136	30.4736	31.7780	33.9052	36.6691	39.1528	(72)
Total internal gains	316.6985	325.4869	311.7804	303.0404	287.9530	278.5645	268.3745	267.9622	275.7829	283.7907	299.7563	309.6929	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
West	2.7200	19.6403	0.3300	0.0000	0.7700	13.5744	(80)

Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	389.6347	457.8750	510.0636	570.0988	601.2644	594.4265	570.9997	536.2853	498.4114	435.1654	388.7105	371.0209	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.1217	77.2462	77.3686	77.9487	78.0582	78.5720	78.5720	78.6679	78.3733	78.0582	77.8370	77.6071	
alpha	6.1414	6.1497	6.1579	6.1966	6.2039	6.2381	6.2381	6.2445	6.2249	6.2039	6.1891	6.1738	
util living area	0.9965	0.9902	0.9723	0.9057	0.7615	0.5580	0.4036	0.4480	0.6979	0.9398	0.9909	0.9974	(86)
MIT	20.0455	20.2317	20.4759	20.7654	20.9365	20.9920	20.9991	20.9983	20.9710	20.7338	20.3346	20.0105	(87)
Th 2	20.0540	20.0554	20.0567	20.0631	20.0643	20.0698	20.0698	20.0709	20.0677	20.0643	20.0619	20.0593	(88)
util rest of house	0.9953	0.9867	0.9625	0.8758	0.7026	0.4803	0.3188	0.3585	0.6164	0.9134	0.9870	0.9965	(89)
MIT 2	19.1942	19.3794	19.6183	19.8901	20.0274	20.0668	20.0696	20.0705	20.0548	19.8699	19.4877	19.1638	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.6140	19.7997	20.0412	20.3217	20.4757	20.5230	20.5280	20.5280	20.5066	20.2959	19.9053	19.5813	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6140	19.7997	20.0412	20.3217	20.4757	20.5230	20.5280	20.5280	20.5066	20.2959	19.9053	19.5813	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9855	0.9623	0.8848	0.7295	0.5186	0.3607	0.4027	0.6560	0.9209	0.9862	0.9958	(94)
Useful gains	387.4910	451.2415	490.8254	504.4383	438.6507	308.2675	205.9449	215.9621	326.9561	400.7237	383.3290	369.4707	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	818.9288	795.4888	721.8165	604.3042	463.6584	310.8927	206.1741	216.4091	337.1284	512.2766	678.4837	817.3846	(97)
Space heating kWh	320.9897	231.3342	171.8574	71.9035	18.6057	0.0000	0.0000	0.0000	0.0000	82.9954	212.5114	333.2479	(98a)
Space heating requirement - total per year (kWh/year)												1443.4452	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	320.9897	231.3342	171.8574	71.9035	18.6057	0.0000	0.0000	0.0000	0.0000	82.9954	212.5114	333.2479	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1443.4452	
Space heating per m2											(98c) / (4) =	27.9467	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	493.3941	388.4166	398.4281	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9553	0.9823	0.9730	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	471.3602	381.5294	387.6743	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	667.2663	641.4060	602.2981	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	141.0523	193.3482	159.6802	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.2631	48.3370	39.9200	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												123.5202	(107)
Energy for space heating												27.9467	(99)
Energy for space cooling												2.3915	(108)
Total												30.3381	(109)
Fabric Energy Efficiency (DFEE)												30.3	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.7075	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) =	0.1519	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4019	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3416	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4355	0.4270	0.4184	0.3757	0.3672	0.3245	0.3245	0.3160	0.3416	0.3672	0.3843	0.4013	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5948	0.5912	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8600	1.1450	12.4351			(27)
Brickwork	45.7800	10.8600	34.9200	0.1800	6.2856			(29a)
Communal Wall	7.5300	2.0600	5.4700	0.1800	0.9846			(29a)
Total net area of external elements Aum(A, m2)			53.3100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.7653			(33)
Main dwelling								
Party Wall 1			38.2700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.4527	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.2100	0.0700	2.0447
E18 Party wall between dwellings	6.3600	0.0600	0.3816
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0500	0.9245
E16 Corner (normal)	3.1800	0.0900	0.2862
E25 Staggered party wall between dwellings	3.1800	0.0600	0.1908
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.8543	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	29.6196	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.8535	25.6935	25.5366	24.7997	24.6618	24.0200	24.0200	23.9012	24.2672	24.6618	24.9407	25.2323	(38)
Heat transfer coeff	55.4731	55.3131	55.1562	54.4193	54.2814	53.6396	53.6396	53.5208	53.8869	54.2814	54.5603	54.8519	(39)
Average = Sum(39)m / 12 =												54.4186	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0740	1.0709	1.0679	1.0536	1.0509	1.0385	1.0385	1.0362	1.0433	1.0509	1.0563	1.0620	(40)
HLP (average)												1.0536	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7387	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

	32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)
Average daily hot water use (litres/day)												50.8820	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5117	53.9894	52.3273	50.2580	48.4122	46.4939	46.0949	47.7536	49.4549	51.4249	53.5126	55.4336	(44)
Energy conte	87.9169	76.8803	80.4252	68.8007	65.1722	57.1697	55.7477	59.1289	60.9828	69.7831	76.2385	86.7957	(45)
Energy content (annual)										Total = Sum(45)m =		845.0417	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(64)
									Total per year (kWh/year) = Sum(64)m =			718.2855	(64)
12Total per year (kWh/year)												718	(64)
Electric shower(s)	42.7425	38.0839	41.5862	39.6852	40.4299	38.5662	39.8517	40.4299	39.6852	41.5862	40.8042	42.7425	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							486.1935	(64a)
Heat gains from water heating, kWh/month	29.3680	25.8580	27.4869	24.5415	23.9566	21.7901	21.8093	22.6724	22.8801	25.2255	26.4017	29.1297	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)

Water heating gains (Table 5)

	39.4731	38.4792	36.9448	34.0854	32.1997	30.2640	29.3136	30.4736	31.7780	33.9052	36.6691	39.1528	(72)

Total internal gains

	316.6985	325.4869	311.7804	303.0404	287.9530	278.5645	268.3745	267.9622	275.7829	283.7907	299.7563	309.6929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.7200	46.7521	0.6300	0.7000	0.7700	38.8635	(78)
West	8.1400	19.6403	0.6300	0.7000	0.7700	48.8589	(80)

Solar gains	87.7223	159.2267	238.4806	321.1985	376.8282	379.8959	363.9756	322.7195	267.7615	182.0625	106.9877	73.7608	(83)
Total gains	404.4209	484.7136	550.2610	624.2389	664.7812	658.4604	632.3500	590.6817	543.5443	465.8532	406.7440	383.4537	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.3450	74.5601	74.7722	75.7846	75.9771	76.8862	76.8862	77.0569	76.5335	75.9771	75.5887	75.1869	
alpha	5.9563	5.9707	5.9848	6.0523	6.0651	6.1257	6.1257	6.1371	6.1022	6.0651	6.0392	6.0125	
util living area	0.9959	0.9878	0.9641	0.8801	0.7192	0.5167	0.3727	0.4157	0.6612	0.9266	0.9891	0.9970	(86)
MIT	20.0162	20.2259	20.4936	20.7943	20.9496	20.9942	20.9993	20.9987	20.9766	20.7494	20.3290	19.9848	(87)
Th 2	20.0221	20.0247	20.0271	20.0389	20.0411	20.0514	20.0514	20.0533	20.0474	20.0411	20.0366	20.0320	(88)
util rest of house	0.9945	0.9835	0.9518	0.8453	0.6584	0.4424	0.2927	0.3308	0.5798	0.8960	0.9845	0.9959	(89)
MIT 2	19.1391	19.3481	19.6089	19.8909	20.0127	20.0492	20.0512	20.0530	20.0373	19.8617	19.4612	19.1160	(90)
Living area fraction									fLA = Living area / (4) =			0.4931	(91)
MIT	19.5716	19.7810	20.0452	20.3364	20.4747	20.5152	20.5188	20.5194	20.5005	20.2995	19.8891	19.5445	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5716	19.7810	20.0452	20.3364	20.4747	20.5152	20.5188	20.5194	20.5005	20.2995	19.8891	19.5445	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9821	0.9521	0.8569	0.6868	0.4790	0.3322	0.3727	0.6195	0.9053	0.9836	0.9952	(94)
Useful gains	401.8220	476.0575	523.8945	534.9139	456.5561	315.4021	210.0360	220.1445	336.7232	421.7193	400.0789	381.5978	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	847.1621	823.1128	747.0995	622.3601	476.3052	317.2900	210.2009	220.4712	344.9005	526.5010	697.7783	841.6729	(97)
Space heating kWh	331.3330	233.2212	166.0645	62.9612	14.6933	0.0000	0.0000	0.0000	0.0000	77.9576	214.3436	342.2959	(98a)
Space heating requirement - total per year (kWh/year)												1442.8704	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	331.3330	233.2212	166.0645	62.9612	14.6933	0.0000	0.0000	0.0000	0.0000	77.9576	214.3436	342.2959	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1442.8704	
Space heating per m2											(98c) / (4) =	27.9355	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	504.2126	396.9333	406.7580	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9679	0.9876	0.9805	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	488.0368	391.9950	398.8364	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	742.1110	713.1142	665.8783	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	182.9335	238.9127	198.6792	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	45.7334	59.7282	49.6698	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												155.1313	(107)
Energy for space heating												27.9355	(99)
Energy for space cooling												3.0035	(108)
Total												30.9390	(109)
Fabric Energy Efficiency (TFEE)												30.9	(109)

Full SAP Calculation Printout

Plot Reference	P-28	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-28
Plot Address	Flat 8, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	87 B	**DER**	4.25	**TER**	13.77
Environmental	97 A	**% DER < TER**			69.14
CO_2 Emissions (t/year)	0.17	**DFEE**	30.34	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			1.94
% DPER < TPER	39.75	**DPER**	44.17	**TPER**	73.31

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	131.7075	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8600	(17)
Infiltration rate		0.1430	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1215	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1550	0.1519	0.1489	0.1337	0.1307	0.1155	0.1155	0.1124	0.1215	0.1307	0.1367	0.1428	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2910	0.2879	0.2849	0.2697	0.2667	0.2515	0.2515	0.2484	0.2576	0.2667	0.2727	0.2788	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	45.7800	10.8600	34.9200	0.2100	7.3332	110.0000	3841.1999	(29a)
Communal Wall	7.5300	2.0600	5.4700	0.2200	1.2034	110.0000	601.7000	(29a)
Total net area of external elements Aum(A, m2)			53.3100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4437			(33)
Main dwelling								
Party Wall 1			38.2700	0.0000	0.0000	110.0000	4209.7001	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			114.3700			9.0000	1029.3300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14846.9300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.4527	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.2100	0.0380	1.1100
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	3.1800	0.0540	0.1717
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0814 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.5251 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.6468	12.5148	12.3827	11.7223	11.5902	10.9299	10.9299	10.7978	11.1940	11.5902	11.8544	12.1185	(38)
Heat transfer coeff	42.1719	42.0398	41.9078	41.2474	41.1153	40.4549	40.4549	40.3229	40.7191	41.1153	41.3795	41.6436	(39)
Average = Sum(39)m / 12 =												41.2144	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8165	0.8139	0.8114	0.7986	0.7960	0.7833	0.7833	0.7807	0.7884	0.7960	0.8012	0.8063	(40)
HLP (average)												0.7980	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)
Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
										Total per year (kWh/year) = Sum(64)m =		2007.3944	(64)
12Total per year (kWh/year)												2007	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains	354.2931	362.0874	346.0852	331.8094	313.4656	300.6378	288.0966	289.2516	298.9655	310.8102	332.0596	346.5342	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
West	2.7200	19.6403	0.3300	0.0000	0.7700	13.5744	(80)

Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	427.2292	494.4754	544.3684	598.8678	626.7770	616.4998	590.7218	557.5747	521.5941	462.1848	421.0139	407.8622	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	97.7937	98.1010	98.4101	99.9857	100.3069	101.9442	101.9442	102.2781	101.2829	100.3069	99.6665	99.0343	
alpha	7.5196	7.5401	7.5607	7.6657	7.6871	7.7963	7.7963	7.8185	7.7522	7.6871	7.6444	7.6023	
util living area	0.9907	0.9729	0.9257	0.7901	0.6047	0.4197	0.3013	0.3326	0.5366	0.8477	0.9735	0.9930	(86)
MIT	20.4486	20.6157	20.7962	20.9490	20.9933	20.9997	21.0000	21.0000	20.9979	20.9294	20.6748	20.4209	(87)
Th 2	20.2391	20.2413	20.2435	20.2546	20.2568	20.2679	20.2679	20.2701	20.2634	20.2568	20.2523	20.2479	(88)
util rest of house	0.9877	0.9649	0.9065	0.7527	0.5584	0.3718	0.2512	0.2799	0.4803	0.8077	0.9643	0.9907	(89)
MIT 2	19.6090	19.8185	20.0356	20.2101	20.2521	20.2677	20.2679	20.2701	20.2623	20.1968	19.9033	19.5815	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	20.0230	20.2116	20.4107	20.5745	20.6176	20.6287	20.6289	20.6300	20.6250	20.5581	20.2837	19.9954	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0230	20.2116	20.4107	20.5745	20.6176	20.6287	20.6289	20.6300	20.6250	20.5581	20.2837	19.9954	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9866	0.9645	0.9111	0.7692	0.5810	0.3954	0.2759	0.3059	0.5080	0.8247	0.9648	0.9898	(94)
Useful gains	421.5193	476.9393	495.9736	460.6516	364.1601	243.7819	162.9833	170.5545	264.9929	381.1557	406.1747	403.6990	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	663.0702	643.6974	582.9659	481.5418	366.6515	243.8887	162.9885	170.5658	265.6932	409.4289	545.5360	657.7785	(97)
Space heating kWh	179.7139	112.0614	64.7222	15.0409	1.8536	0.0000	0.0000	0.0000	0.0000	21.0353	100.3401	189.0352	(98a)
Space heating requirement - total per year (kWh/year)												683.8026	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	179.7139	112.0614	64.7222	15.0409	1.8536	0.0000	0.0000	0.0000	0.0000	21.0353	100.3401	189.0352	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												683.8026	
Space heating per m2											(98c) / (4) =	13.2392	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	179.7139	112.0614	64.7222	15.0409	1.8536	0.0000	0.0000	0.0000	0.0000	21.0353	100.3401	189.0352	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	179.7139	112.0614	64.7222	15.0409	1.8536	0.0000	0.0000	0.0000	0.0000	21.0353	100.3401	189.0352	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												683.8026	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	

Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.4014	(230a)
Total electricity for the above, kWh/year	94.4014	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1469.4836	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	683.8026	0.1584	108.3461	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			186.6547	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			219.4125	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	683.8026	1.5865	1084.8482	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)
Space and water heating			1929.4524	(279)
Pumps, fans and electric keep-hot	94.4014	1.5128	142.8104	(281)
Energy for lighting	136.2372	1.5338	208.9651	(282)
Total Primary energy kWh/year			2281.2279	(286)
Dwelling Primary energy Rate (DPER)			44.1700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.7075	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1519	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4019	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3416	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4355	0.4270	0.4184	0.3757	0.3672	0.3245	0.3245	0.3160	0.3416	0.3672	0.3843	0.4013	(22b)
Effective ac	0.5948	0.5912	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8600	1.1450	12.4351			(27)
Brickwork	45.7800	10.8600	34.9200	0.1800	6.2856			(29a)
Communal Wall	7.5300	2.0600	5.4700	0.1800	0.9846			(29a)
Total net area of external elements Aum(A, m2)			53.3100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.7653			(33)
Main dwelling								
Party Wall 1			38.2700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 287.4527 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.2100	0.0700	2.0447
E18 Party wall between dwellings	6.3600	0.0600	0.3816
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0500	0.9245
E16 Corner (normal)	3.1800	0.0900	0.2862
E25 Staggered party wall between dwellings	3.1800	0.0600	0.1908
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8543 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.6196 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.8535	25.6935	25.5366	24.7997	24.6618	24.0200	24.0200	23.9012	24.2672	24.6618	24.9407	25.2323	(38)
Heat transfer coeff	55.4731	55.3131	55.1562	54.4193	54.2814	53.6396	53.6396	53.5208	53.8869	54.2814	54.5603	54.8519	(39)

Average = Sum(39)m / 12 = 54.4186

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0740	1.0709	1.0679	1.0536	1.0509	1.0385	1.0385	1.0362	1.0433	1.0509	1.0563	1.0620	(40)
HLP (average)												1.0536	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	219.0409	193.8256	206.0225	181.1975	175.7315	158.4238	156.3170	162.4195	164.1044	182.9195	194.4456	216.6389	(62)
WWHRS	-24.3997	-21.5793	-22.5966	-18.7109	-17.4379	-14.9217	-13.9867	-14.8735	-15.4386	-18.2004	-20.6188	-23.9478	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
										Total per year (kWh/year) = Sum(64)m =		1984.3750	(64)
12Total per year (kWh/year)												1984	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	94.6142	84.1221	90.2856	81.3286	80.2138	73.7564	73.7585	75.7876	75.6451	82.6039	85.7336	93.8156	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)												
	127.1696	125.1817	121.3516	112.9564	107.8143	102.4394	99.1378	101.8651	105.0627	111.0267	119.0744	126.0962 (72)
Total internal gains												
	407.3951	415.1894	399.1873	384.9114	366.5676	350.7398	338.1986	339.3536	349.0676	363.9122	385.1616	399.6363 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.7200	46.7521	0.6300	0.7000	0.7700	38.8635	(78)
West	8.1400	19.6403	0.6300	0.7000	0.7700	48.8589	(80)

Solar gains	87.7223	159.2267	238.4806	321.1985	376.8282	379.8959	363.9756	322.7195	267.7615	182.0625	106.9877	73.7608 (83)
Total gains	495.1174	574.4161	637.6679	706.1099	743.3958	730.6357	702.1742	662.0732	616.8290	545.9747	492.1494	473.3971 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.3450	74.5601	74.7722	75.7846	75.9771	76.8862	76.8862	77.0569	76.5335	75.9771	75.5887	75.1869
alpha	5.9563	5.9707	5.9848	6.0523	6.0651	6.1257	6.1257	6.1371	6.1022	6.0651	6.0392	6.0125
util living area												
	0.9887	0.9728	0.9342	0.8266	0.6568	0.4674	0.3358	0.3713	0.5916	0.8724	0.9729	0.9911 (86)
MIT	20.1791	20.3764	20.6162	20.8589	20.9688	20.9966	20.9996	20.9993	20.9869	20.8336	20.4732	20.1484 (87)
Th 2	20.0221	20.0247	20.0271	20.0389	20.0411	20.0514	20.0514	20.0533	20.0474	20.0411	20.0366	20.0320 (88)
util rest of house												
	0.9849	0.9642	0.9148	0.7853	0.5969	0.3993	0.2636	0.2952	0.5149	0.8299	0.9628	0.9880 (89)
MIT 2	19.0950	19.3426	19.6343	19.9139	20.0193	20.0498	20.0513	20.0531	20.0405	19.8974	19.4756	19.0640 (90)
Living area fraction									fLA = Living area / (4) =			0.4931 (91)
MIT	19.6296	19.8524	20.1185	20.3799	20.4875	20.5167	20.5189	20.5197	20.5072	20.3591	19.9676	19.5987 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6296	19.8524	20.1185	20.3799	20.4875	20.5167	20.5189	20.5197	20.5072	20.3591	19.9676	19.5987 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9829	0.9624	0.9168	0.8007	0.6253	0.4329	0.2992	0.3328	0.5525	0.8452	0.9619	0.9862	(94)
Useful gains	486.6710	552.8081	584.6222	565.3966	464.8811	316.2810	210.1187	220.3167	340.7853	461.4445	473.3901	466.8817	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	850.3820	827.0625	751.1445	624.7277	476.9972	317.3696	210.2098	220.4893	345.2637	529.7358	702.0583	844.6492	(97)
Space heating kWh													
	270.6010	184.2989	123.8926	42.7184	9.0144	0.0000	0.0000	0.0000	0.0000	50.8087	164.6411	281.0590	(98a)
Space heating requirement - total per year (kWh/year)												1127.0342	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	270.6010	184.2989	123.8926	42.7184	9.0144	0.0000	0.0000	0.0000	0.0000	50.8087	164.6411	281.0590	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1127.0342	
Space heating per m2											(98c) / (4) =	21.8206	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	270.6010	184.2989	123.8926	42.7184	9.0144	0.0000	0.0000	0.0000	0.0000	50.8087	164.6411	281.0590	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	293.1755	199.6738	134.2282	46.2821	9.7665	0.0000	0.0000	0.0000	0.0000	55.0474	178.3761	304.5059	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7988	84.2117	83.1994	81.5200	80.2382	79.8000	79.8000	79.8000	79.8000	81.7533	83.9382	84.9052	(217)
Fuel for water heating, kWh/month													
	229.5328	204.5395	220.4654	199.3213	197.2797	179.8273	178.3588	184.8948	186.2980	201.4832	207.0891	226.9485	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9214	12.7728	11.5005	8.4257	6.5083	5.3173	5.9371	7.7172	10.0239	13.1519	14.8551	16.3640	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.9766	-20.7826	-31.4959	-37.4135	-42.1278	-39.9999	-39.5329	-36.4411	-31.2895	-24.6504	-15.7505	-11.9625	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.9299	-10.6083	-21.5278	-32.9858	-44.2484	-44.6716	-44.1257	-37.0541	-26.7727	-15.3613	-6.6443	-3.8795	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1221.0555	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2416.0383	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.4952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-638.2327	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3213.3562	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1221.0555	0.2100	256.4217	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2416.0383	0.2100	507.3680	(264)
Space and water heating			763.7897	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.4952	0.1443	18.5458	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	0.1335	-46.1008	
PV Unit electricity exported	-292.8094	0.1253	-36.6969	
Total			-82.7977	(269)
Total CO2, kg/year			711.4671	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1221.0555	1.1300	1379.7927	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2416.0383	1.1300	2730.1232	(278)
Space and water heating			4109.9159	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.4952	1.5338	197.0902	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	1.4932	-515.7819	
PV Unit electricity exported	-292.8094	0.4600	-134.6951	
Total			-650.4770	(283)
Total Primary energy kWh/year			3786.6299	(286)
Target Primary Energy Rate (TPER)			73.3100	(287)

Full SAP Calculation Printout

Plot Reference	P-28	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-28
Plot Address	Flat 8, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	87 B	**DER**	4.25	**TER**	13.77
Environmental	97 A	**% DER < TER**			69.14
CO_2 Emissions (t/year)	0.17	**DFEE**	30.34	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			1.94
% DPER < TPER	39.75	**DPER**	44.17	**TPER**	73.31

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		131.7075	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8600	(17)
Infiltration rate		0.1430	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1215	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1550	0.1519	0.1489	0.1337	0.1307	0.1155	0.1155	0.1124	0.1215	0.1307	0.1367	0.1428	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2910	0.2879	0.2849	0.2697	0.2667	0.2515	0.2515	0.2484	0.2576	0.2667	0.2727	0.2788	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	45.7800	10.8600	34.9200	0.2100	7.3332	110.0000	3841.1999	(29a)
Communal Wall	7.5300	2.0600	5.4700	0.2200	1.2034	110.0000	601.7000	(29a)
Total net area of external elements Aum(A, m2)			53.3100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4437			(33)
Main dwelling								
Party Wall 1			38.2700	0.0000	0.0000	110.0000	4209.7001	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			114.3700			9.0000	1029.3300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14846.9300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		287.4527 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.2100	0.0380	1.1100
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	3.1800	0.0540	0.1717
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0814 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.5251 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.6468	12.5148	12.3827	11.7223	11.5902	10.9299	10.9299	10.7978	11.1940	11.5902	11.8544	12.1185	(38)
Heat transfer coeff	42.1719	42.0398	41.9078	41.2474	41.1153	40.4549	40.4549	40.3229	40.7191	41.1153	41.3795	41.6436	(39)
Average = Sum(39)m / 12 =												41.2144	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8165	0.8139	0.8114	0.7986	0.7960	0.7833	0.7833	0.7807	0.7884	0.7960	0.8012	0.8063	(40)
HLP (average)												0.7980	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)
Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
										Total per year (kWh/year) = Sum(64)m =		2007.3944	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
West	2.7200	19.6403	0.3300	0.0000	0.7700	13.5744	(80)

Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	477.3818	535.0361	587.9888	632.3953	654.9515	635.9633	609.9827	578.2176	544.8330	495.5167	459.6987	455.2580	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	97.7937	98.1010	98.4101	99.9857	100.3069	101.9442	101.9442	102.2781	101.2829	100.3069	99.6665	99.0343	
alpha	7.5196	7.5401	7.5607	7.6657	7.6871	7.7963	7.7963	7.8185	7.7522	7.6871	7.6444	7.6023	
util living area	0.9820	0.9589	0.8972	0.7581	0.5799	0.4069	0.2918	0.3208	0.5142	0.8102	0.9577	0.9863	(86)
MIT	20.5380	20.6784	20.8426	20.9613	20.9949	20.9997	21.0000	21.0000	20.9984	20.9485	20.7346	20.5074	(87)
Th 2	20.2391	20.2413	20.2435	20.2546	20.2568	20.2679	20.2679	20.2701	20.2634	20.2568	20.2523	20.2479	(88)
util rest of house	0.9766	0.9477	0.8739	0.7198	0.5351	0.3605	0.2433	0.2699	0.4600	0.7673	0.9443	0.9821	(89)
MIT 2	19.7205	19.8940	20.0869	20.2214	20.2533	20.2677	20.2679	20.2701	20.2626	20.2143	19.9743	19.6900	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	20.1236	20.2808	20.4596	20.5863	20.6190	20.6287	20.6289	20.6300	20.6254	20.5764	20.3492	20.0931	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1236	20.2808	20.4596	20.5863	20.6190	20.6287	20.6289	20.6300	20.6254	20.5764	20.3492	20.0931	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9484	0.8809	0.7372	0.5570	0.3834	0.2672	0.2950	0.4867	0.7864	0.9463	0.9811	(94)
Useful gains	465.7648	507.4236	517.9796	466.2252	364.8272	243.8052	162.9846	170.5575	265.1886	389.6916	434.9975	446.6487	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	667.3113	646.6068	585.0138	482.0275	366.7083	243.8908	162.9886	170.5661	265.7100	410.1807	548.2446	661.8465	(97)
Space heating kWh	149.9506	93.5311	49.8735	11.3776	1.3995	0.0000	0.0000	0.0000	0.0000	15.2439	81.5380	160.1072	(98a)
Space heating requirement - total per year (kWh/year)												563.0213	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	149.9506	93.5311	49.8735	11.3776	1.3995	0.0000	0.0000	0.0000	0.0000	15.2439	81.5380	160.1072	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												563.0213	
Space heating per m2											(98c) / (4) =	10.9007	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	149.9506	93.5311	49.8735	11.3776	1.3995	0.0000	0.0000	0.0000	0.0000	15.2439	81.5380	160.1072	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	149.9506	93.5311	49.8735	11.3776	1.3995	0.0000	0.0000	0.0000	0.0000	15.2439	81.5380	160.1072	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												563.0213	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.0425	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.4014	(230a)
Total electricity for the above, kWh/year	94.4014	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1348.7023	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	563.0213	16.4900	92.8422	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	16.4900	91.5265	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.4014	16.4900	15.5668	(249)
Energy for lighting	136.2372	16.4900	22.4655	(250)
Additional standing charges			0.0000	(251)
Total energy cost			222.4010	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8284	(257)
SAP value		86.5717	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	563.0213	0.1587	89.3322	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			167.6407	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			200.3986	(272)
CO2 emissions per m2			3.8800	(273)
EI value			97.2216	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.6500						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.7075	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	

Measured/design AP50	2.8600	(17)
Infiltration rate	0.1430	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1215	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1307	0.1246	0.1246	0.1155	0.1185	0.1033	0.1033	0.1003	0.1033	0.1155	0.1124	0.1215	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2667	0.2606	0.2606	0.2515	0.2545	0.2393	0.2393	0.2363	0.2393	0.2515	0.2484	0.2576	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	45.7800	10.8600	34.9200	0.2100	7.3332	110.0000	3841.1999	(29a)
Communal Wall	7.5300	2.0600	5.4700	0.2200	1.2034	110.0000	601.7000	(29a)
Total net area of external elements Aum(A, m2)			53.3100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4437			(33)
Main dwelling								
Party Wall 1			38.2700	0.0000	0.0000	110.0000	4209.7001	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			114.3700			9.0000	1029.3300	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	14846.9300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.4527	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.2100	0.0380	1.1100
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	3.1800	0.0540	0.1717
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.0814	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	29.5251	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.5902	11.3261	11.3261	10.9299	11.0619	10.4016	10.4016	10.2695	10.4016	10.9299	10.7978	11.1940	(38)
Heat transfer coeff	41.1153	40.8512	40.8512	40.4549	40.5870	39.9266	39.9266	39.7946	39.9266	40.4549	40.3229	40.7191	(39)
Average = Sum(39)m / 12 =												40.4109	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7960	0.7909	0.7909	0.7833	0.7858	0.7730	0.7730	0.7705	0.7730	0.7833	0.7807	0.7884	(40)
HLP (average)												0.7824	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7387	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day)	100.0897	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte 172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)									Total = Sum(45)m =			1662.4694	
Distribution loss (46)m = 0.15 x (45)m													
25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)

											Total per year (kWh/year) = Sum(64)m =	2007.3944	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396		(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains													
	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
South	2.7200	54.2217	0.3300	0.0000	0.7700	37.4754	(78)
West	2.7200	23.8018	0.3300	0.0000	0.7700	16.4506	(80)

Solar gains	86.7064	137.5977	204.8017	280.5280	321.2121	342.8499	325.1121	295.1017	245.2762	168.9195	104.1885	73.3186	(83)
Total gains	491.1520	540.2458	594.5073	645.8648	662.8522	662.9512	632.4697	604.9961	567.4807	513.0615	474.9329	467.2486	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	100.3069	100.9555	100.9555	101.9442	101.6125	103.2931	103.2931	103.6360	103.2931	101.9442	102.2781	101.2829	
alpha	7.6871	7.7304	7.7304	7.7963	7.7742	7.8862	7.8862	7.9091	7.8862	7.7963	7.8185	7.7522	
util living area													
	0.9699	0.9389	0.8533	0.6823	0.4949	0.3132	0.2083	0.2236	0.4219	0.7276	0.9253	0.9764	(86)
MIT	20.6507	20.7679	20.9048	20.9834	20.9986	21.0000	21.0000	21.0000	20.9997	20.9783	20.8326	20.6230	(87)
Th 2	20.2568	20.2612	20.2612	20.2679	20.2656	20.2768	20.2768	20.2790	20.2768	20.2679	20.2701	20.2634	(88)
util rest of house													
	0.9611	0.9233	0.8239	0.6414	0.4505	0.2696	0.1627	0.1762	0.3712	0.6789	0.9039	0.9693	(89)
MIT 2	19.8749	20.0183	20.1712	20.2547	20.2648	20.2768	20.2768	20.2790	20.2766	20.2516	20.1042	19.8471	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	20.2575	20.3880	20.5330	20.6141	20.6267	20.6334	20.6334	20.6345	20.6332	20.6100	20.4634	20.2297	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2575	20.3880	20.5330	20.6141	20.6267	20.6334	20.6334	20.6345	20.6332	20.6100	20.4634	20.2297	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9611	0.9262	0.8352	0.6609	0.4724	0.2911	0.1852	0.1996	0.3962	0.7021	0.9100	0.9689	(94)
Useful gains	472.0517	500.3873	496.5085	426.8791	313.1099	192.9731	117.1213	120.7581	224.8227	360.2180	432.1955	452.7230	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	623.2041	600.0201	536.4968	433.4370	313.6017	192.9812	117.1214	120.7584	224.9146	368.5431	502.5602	616.0683	(97)
Space heating kWh													
	112.4574	66.9533	29.7513	4.7217	0.3659	0.0000	0.0000	0.0000	0.0000	6.1938	50.6626	121.5289	(98a)
Space heating requirement - total per year (kWh/year)												392.6350	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	112.4574	66.9533	29.7513	4.7217	0.3659	0.0000	0.0000	0.0000	0.0000	6.1938	50.6626	121.5289	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												392.6350	
Space heating per m2											(98c) / (4) =	7.6018	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	112.4574	66.9533	29.7513	4.7217	0.3659	0.0000	0.0000	0.0000	0.0000	6.1938	50.6626	121.5289	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)

	112.4574	66.9533	29.7513	4.7217	0.3659	0.0000	0.0000	0.0000	0.0000	6.1938	50.6626	121.5289 (211)

Space heating efficiency (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

Space heating fuel (main heating system 2)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390 (64)

Efficiency of water heater 361.6650 (216)

(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)

Fuel for water heating, kWh/month

	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176 (231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1 392.6350 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 555.0425 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 94.4014 (230a)
Total electricity for the above, kWh/year 94.4014 (231)
Electricity for lighting (calculated in Appendix L) 136.2372 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1178.3160 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	392.6350	27.6700	108.6421	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	27.6700	153.5803	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.4014	27.6700	26.1209	(249)
Energy for lighting	136.2372	27.6700	37.6968	(250)
Additional standing charges			0.0000	(251)
Total energy cost			326.0400	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	392.6350	0.1595	62.6202	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			140.9287	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			173.6866	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	392.6350	1.5903	624.4119	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)
Space and water heating			1469.0161	(279)
Pumps, fans and electric keep-hot	94.4014	1.5128	142.8104	(281)
Energy for lighting	136.2372	1.5338	208.9651	(282)
Total Primary energy kWh/year			1820.7916	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 87
Current environmental impact rating: A 97

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£326	£326	£0
Space heating	£135	£135	£0
Water heating	£154	£154	£0
Lighting	£38	£38	£0
Total cost of fuels	£326	£326	£0
Total cost of uses	£327	£327	£0
Delivered energy	23 kWh/m²	23 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	35 kWh/m²	35 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.7075	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8600 (17)
Infiltration rate		0.1430 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1215 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1550	0.1519	0.1489	0.1337	0.1307	0.1155	0.1155	0.1124	0.1215	0.1307	0.1367	0.1428	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

Effective ac	0.2910	0.2879	0.2849	0.2697	0.2667	0.2515	0.2515	0.2484	0.2576	0.2667	0.2727	0.2788	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	45.7800	10.8600	34.9200	0.2100	7.3332	110.0000	3841.1999	(29a)
Communal Wall	7.5300	2.0600	5.4700	0.2200	1.2034	110.0000	601.7000	(29a)
Total net area of external elements Aum(A, m2)			53.3100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.4437			(33)
Main dwelling								
Party Wall 1			38.2700	0.0000	0.0000	110.0000	4209.7001	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			114.3700			9.0000	1029.3300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14846.9300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		287.4527 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	29.2100	0.0380	1.1100
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	3.1800	0.0540	0.1717
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0814 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	29.5251 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.6468	12.5148	12.3827	11.7223	11.5902	10.9299	10.9299	10.7978	11.1940	11.5902	11.8544	12.1185	(38)
Heat transfer coeff	42.1719	42.0398	41.9078	41.2474	41.1153	40.4549	40.4549	40.3229	40.7191	41.1153	41.3795	41.6436	(39)
Average = Sum(39)m / 12 =												41.2144	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8165	0.8139	0.8114	0.7986	0.7960	0.7833	0.7833	0.7807	0.7884	0.7960	0.8012	0.8063	(40)
HLP (average)												0.7980	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7387 (42)

Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day)	100.0897 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte 172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)

Energy content (annual)	Total = Sum(45)m =	1662.4694

Distribution loss (46)m = 0.15 x (45)m

25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)

Water storage loss (or HIU loss):	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)

Total per year (kWh/year) = Sum(64)m =	2007.3944 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000 (64a)

Heat gains from water heating, kWh/month

57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498 (71)
Water heating gains (Table 5)												
	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941 (72)
Total internal gains												
	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
West	2.7200	19.6403	0.3300	0.0000	0.7700	13.5744	(80)

Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	477.3818	535.0361	587.9888	632.3953	654.9515	635.9633	609.9827	578.2176	544.8330	495.5167	459.6987	455.2580	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	97.7937	98.1010	98.4101	99.9857	100.3069	101.9442	101.9442	102.2781	101.2829	100.3069	99.6665	99.0343	
alpha	7.5196	7.5401	7.5607	7.6657	7.6871	7.7963	7.7963	7.8185	7.7522	7.6871	7.6444	7.6023	
util living area													
	0.9820	0.9589	0.8972	0.7581	0.5799	0.4069	0.2918	0.3208	0.5142	0.8102	0.9577	0.9863	(86)
MIT	20.5380	20.6784	20.8426	20.9613	20.9949	20.9997	21.0000	21.0000	20.9984	20.9485	20.7346	20.5074	(87)
Th 2	20.2391	20.2413	20.2435	20.2546	20.2568	20.2679	20.2679	20.2701	20.2634	20.2568	20.2523	20.2479	(88)
util rest of house													
	0.9766	0.9477	0.8739	0.7198	0.5351	0.3605	0.2433	0.2699	0.4600	0.7673	0.9443	0.9821	(89)
MIT 2	19.7205	19.8940	20.0869	20.2214	20.2533	20.2677	20.2679	20.2701	20.2626	20.2143	19.9743	19.6900	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	20.1236	20.2808	20.4596	20.5863	20.6190	20.6287	20.6289	20.6300	20.6254	20.5764	20.3492	20.0931	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1236	20.2808	20.4596	20.5863	20.6190	20.6287	20.6289	20.6300	20.6254	20.5764	20.3492	20.0931	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9484	0.8809	0.7372	0.5570	0.3834	0.2672	0.2950	0.4867	0.7864	0.9463	0.9811	(94)
Useful gains	465.7648	507.4236	517.9796	466.2252	364.8272	243.8052	162.9846	170.5575	265.1886	389.6916	434.9975	446.6487	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	667.3113	646.6068	585.0138	482.0275	366.7083	243.8908	162.9886	170.5661	265.7100	410.1807	548.2446	661.8465	(97)
Space heating kWh													
	149.9506	93.5311	49.8735	11.3776	1.3995	0.0000	0.0000	0.0000	0.0000	15.2439	81.5380	160.1072	(98a)
Space heating requirement - total per year (kWh/year)												563.0213	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	149.9506	93.5311	49.8735	11.3776	1.3995	0.0000	0.0000	0.0000	0.0000	15.2439	81.5380	160.1072	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												563.0213	
Space heating per m2											(98c) / (4) =	10.9007	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	149.9506	93.5311	49.8735	11.3776	1.3995	0.0000	0.0000	0.0000	0.0000	15.2439	81.5380	160.1072	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	149.9506	93.5311	49.8735	11.3776	1.3995	0.0000	0.0000	0.0000	0.0000	15.2439	81.5380	160.1072	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	563.0213	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	94.4014	(230a)
Total electricity for the above, kWh/year	94.4014	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1348.7023	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	563.0213	16.4900	92.8422	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	16.4900	91.5265	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	94.4014	16.4900	15.5668	(249)
Energy for lighting	136.2372	16.4900	22.4655	(250)
Additional standing charges			0.0000	(251)
Total energy cost			222.4010	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8284	(257)
SAP value		86.5717	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	563.0213	0.1587	89.3322	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			167.6407	(265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			200.3986	(272)
CO2 emissions per m2			3.8800	(273)
EI value			97.2216	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.5500	(2b) =	131.7075	(1b) - (3b)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.6500 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 131.7075 (5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8600 (17)
Infiltration rate		0.1430 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1215 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1307	0.1246	0.1246	0.1155	0.1185	0.1033	0.1033	0.1003	0.1033	0.1155	0.1124	0.1215	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2667	0.2606	0.2606	0.2515	0.2545	0.2393	0.2393	0.2363	0.2393	0.2515	0.2484	0.2576	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	45.7800	10.8600	34.9200	0.2100	7.3332	110.0000	3841.1999	(29a)
Communal Wall	7.5300	2.0600	5.4700	0.2200	1.2034	110.0000	601.7000	(29a)
Total net area of external elements Aum(A, m2)			53.3100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4437			(33)
Main dwelling								
Party Wall 1			38.2700	0.0000	0.0000	110.0000	4209.7001	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Party Ceiling 1			51.6500			30.0000	1549.5000	(32b)
Internal Wall 1			114.3700			9.0000	1029.3300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14846.9300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	287.4527 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.2100	0.0380	1.1100
E18 Party wall between dwellings	6.3600	0.0380	0.2417
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5400	0.0500	0.2770
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	3.1800	0.0540	0.1717
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0814 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	29.5251 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.5902	11.3261	11.3261	10.9299	11.0619	10.4016	10.4016	10.2695	10.4016	10.9299	10.7978	11.1940	(38)
Heat transfer coeff	41.1153	40.8512	40.8512	40.4549	40.5870	39.9266	39.9266	39.7946	39.9266	40.4549	40.3229	40.7191	(39)
Average = Sum(39)m / 12 =												40.4109	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7960	0.7909	0.7909	0.7833	0.7858	0.7730	0.7730	0.7705	0.7730	0.7833	0.7807	0.7884	(40)
HLP (average)												0.7824	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7387 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day)	100.0897 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use

	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m													
	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
										Total per year (kWh/year) = Sum(64)m =		2007.3944	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains													
	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
South	2.7200	54.2217	0.3300	0.0000	0.7700	37.4754	(78)
West	2.7200	23.8018	0.3300	0.0000	0.7700	16.4506	(80)

Solar gains	86.7064	137.5977	204.8017	280.5280	321.2121	342.8499	325.1121	295.1017	245.2762	168.9195	104.1885	73.3186	(83)
Total gains	491.1520	540.2458	594.5073	645.8648	662.8522	662.9512	632.4697	604.9961	567.4807	513.0615	474.9329	467.2486	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	100.3069	100.9555	100.9555	101.9442	101.6125	103.2931	103.2931	103.6360	103.2931	101.9442	102.2781	101.2829	
alpha	7.6871	7.7304	7.7304	7.7963	7.7742	7.8862	7.8862	7.9091	7.8862	7.7963	7.8185	7.7522	
util living area													
	0.9699	0.9389	0.8533	0.6823	0.4949	0.3132	0.2083	0.2236	0.4219	0.7276	0.9253	0.9764	(86)
MIT	20.6507	20.7679	20.9048	20.9834	20.9986	21.0000	21.0000	21.0000	20.9997	20.9783	20.8326	20.6230	(87)
Th 2	20.2568	20.2612	20.2612	20.2679	20.2656	20.2768	20.2768	20.2790	20.2768	20.2679	20.2701	20.2634	(88)
util rest of house													
	0.9611	0.9233	0.8239	0.6414	0.4505	0.2696	0.1627	0.1762	0.3712	0.6789	0.9039	0.9693	(89)
MIT 2	19.8749	20.0183	20.1712	20.2547	20.2648	20.2768	20.2768	20.2790	20.2766	20.2516	20.1042	19.8471	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	20.2575	20.3880	20.5330	20.6141	20.6267	20.6334	20.6334	20.6345	20.6332	20.6100	20.4634	20.2297	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2575	20.3880	20.5330	20.6141	20.6267	20.6334	20.6334	20.6345	20.6332	20.6100	20.4634	20.2297	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9611	0.9262	0.8352	0.6609	0.4724	0.2911	0.1852	0.1996	0.3962	0.7021	0.9100	0.9689	(94)
Useful gains	472.0517	500.3873	496.5085	426.8791	313.1099	192.9731	117.1213	120.7581	224.8227	360.2180	432.1955	452.7230	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	623.2041	600.0201	536.4968	433.4370	313.6017	192.9812	117.1214	120.7584	224.9146	368.5431	502.5602	616.0683	(97)
Space heating kWh													
	112.4574	66.9533	29.7513	4.7217	0.3659	0.0000	0.0000	0.0000	0.0000	6.1938	50.6626	121.5289	(98a)
Space heating requirement - total per year (kWh/year)												392.6350	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	112.4574	66.9533	29.7513	4.7217	0.3659	0.0000	0.0000	0.0000	0.0000	6.1938	50.6626	121.5289 (98c)

Space heating requirement after solar contribution - total per year (kWh/year) 392.6350

Space heating per m2 (98c) / (4) = 7.6018 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	112.4574	66.9533	29.7513	4.7217	0.3659	0.0000	0.0000	0.0000	0.0000	6.1938	50.6626	121.5289	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	112.4574	66.9533	29.7513	4.7217	0.3659	0.0000	0.0000	0.0000	0.0000	6.1938	50.6626	121.5289	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.0176	7.2417	8.0176	7.7590	8.0176	7.7590	8.0176	8.0176	7.7590	8.0176	7.7590	8.0176	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 392.6350 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 555.0425 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 94.4014 (230a)
Total electricity for the above, kWh/year 94.4014 (231)
Electricity for lighting (calculated in Appendix L) 136.2372 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1178.3160 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	392.6350	27.6700	108.6421	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	27.6700	153.5803	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	94.4014	27.6700	26.1209	(249)
Energy for lighting	136.2372	27.6700	37.6968	(250)
Additional standing charges			0.0000	(251)
Total energy cost			326.0400	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	392.6350	0.1595	62.6202	(261)

Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	555.0425	0.1411	78.3085 (264)
Space and water heating			140.9287 (265)
Pumps, fans and electric keep-hot	94.4014	0.1387	13.0946 (267)
Energy for lighting	136.2372	0.1443	19.6632 (268)
Total CO2, kg/year			173.6866 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	392.6350	1.5903	624.4119 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	555.0425	1.5217	844.6042 (278)
Space and water heating			1469.0161 (279)
Pumps, fans and electric keep-hot	94.4014	1.5128	142.8104 (281)
Energy for lighting	136.2372	1.5338	208.9651 (282)
Total Primary energy kWh/year			1820.7916 (286)

Summary for Input Data

Plot Reference	P-29	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-29
Plot Address	Flat 9, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	83 B	**DER**	5.02	**TER**	15.27
Environmental	97 A	**% DER < TER**			67.13
CO_2 Emissions (t/year)	0.23	**DFEE**	35.01	**TFEE**	39.60
Compliance Check	See BREL	**% DFEE < TFEE**			11.58
% DPER < TPER	36.01	**DPER**	52.01	**TPER**	81.28

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	237.31	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	18.62 m	56.05 m²	2.40 m

8.0 Living Area	23.98	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	25.60	15.27	0.00	None	10.33	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.99	4.93	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	7.93	7.93	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	10.66	10.66	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	37.66	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	96.74

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Cold Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	56.05	56.05 (m²)	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Terrace Floor	Exposed Floor - Solid	Lowest occupied	Other	0.14	None	0.00	0.00	5.81

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	50.24

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Window-Red	Brickwork	East	5.42	
East	Window-Red	Brickwork	East	4.91	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	8.45	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	8.10	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	13.69	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.08	0.33	0.33	Abbey Calculated	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	13.69	0.10	0.10	RCD	No
E10 Eaves (insulation at ceiling level)	Independently assessed	2.40	0.12	0.12		No
E2 Other lintels (including other steel lintels)	Independently assessed	5.31	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	18.49	0.02	0.02	RCD	No
E20 Exposed floor (normal)	Independently assessed	6.82	0.12	0.12	-	No
E12 Gable (insulation at ceiling level)	Independently assessed	7.35	0.08	0.08		No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.70	-0.10	-0.10	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.50	0.03	0.03	RCD	No
E15 Flat roof with parapet	Table K1 - Default	8.81	0.30	0.30		No
E16 Corner (normal)	Gov Approved Scheme	8.55	0.05	0.05	RCD	No

Y-value	0.08	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

Summary for Input Data

elmhurst energy

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.97	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No

Summary for Input Data

Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-29	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-29
Plot Address	Flat 9, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	83 B	**DER**	5.02	**TER**	15.27
Environmental	97 A	**% DER < TER**			67.13
CO_2 Emissions (t/year)	0.23	**DFEE**	35.01	**TFEE**	39.60
Compliance Check	See BREL	**% DFEE < TFEE**			11.58
% DPER < TPER	36.01	**DPER**	52.01	**TPER**	81.28

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	56.0500 (1b)	x	2.4000 (2b)	=	134.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.0500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.5200	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

Effective ac	0.2969	0.2938	0.2906	0.2748	0.2717	0.2559	0.2559	0.2528	0.2622	0.2717	0.2780	0.2843	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			10.3300	1.1450	11.8282			(27)
Terrace Floor			5.8100	0.1400	0.8134	0.0000	0.0000	(28b)
Brickwork	25.6000	10.3300	15.2700	0.2100	3.2067	110.0000	1679.7000	(29a)
Communal Wall	6.9900	2.0600	4.9300	0.2200	1.0846	110.0000	542.3000	(29a)
Lift Shaft Wall	7.9300		7.9300	0.1600	1.2688	110.0000	872.3000	(29a)
Stairwell Wall	10.6600		10.6600	0.1600	1.7056	110.0000	1172.6000	(29a)
Cold Roof	56.0500		56.0500	0.0900	5.0445	9.0000	504.4500	(30)
Total net area of external elements Aum(A, m2)			113.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.4238			(33)
Main dwelling								
Party Wall 1			37.6600	0.0000	0.0000	110.0000	4142.6000	(32)
Party Floor 1			50.2400			70.0000	3516.8000	(32d)
Internal Wall 1			96.7400			9.0000	870.6600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13301.4099 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 237.3133 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	8.4500	0.0380	0.3211
E18 Party wall between dwellings	8.1000	0.0380	0.3078
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0800	0.3300	1.3464
P4 Party wall - Roof (insulation at ceiling level)	13.6900	0.1010	1.3827
E10 Eaves (insulation at ceiling level)	2.4000	0.1200	0.2880
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	6.8200	0.1200	0.8184
E12 Gable (insulation at ceiling level)	7.3500	0.0770	0.5659
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0970	-0.2619
E25 Staggered party wall between dwellings	2.5000	0.0310	0.0775
E15 Flat roof with parapet	8.8100	0.3000	2.6430
E16 Corner (normal)	8.5500	0.0540	0.4617

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.9358 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.1815	13.0414	12.9013	12.2009	12.0608	11.3604	11.3604	11.2203	11.6406	12.0608	12.3410	12.6212	(38)
Heat transfer coeff	49.1173	48.9772	48.8372	48.1367	47.9967	47.2962	47.2962	47.1562	47.5764	47.9967	48.2768	48.5570	(39)
Average = Sum(39)m / 12 =												48.1017	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8763	0.8738	0.8713	0.8588	0.8563	0.8438	0.8438	0.8413	0.8488	0.8563	0.8613	0.8663	(40)
HLP (average)												0.8582	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8681 (42)
Hot water usage for mixer showers

55.5406	54.7060	53.4897	51.1626	49.4452	47.5300	46.4414	47.6485	48.9717	51.0280	53.4051	55.3278	(42a)

Hot water usage for baths

24.0075	23.6510	23.1489	22.2231	21.5299	20.7613	20.3461	20.8447	21.3875	22.2100	23.1548	23.9264	(42b)

Hot water usage for other uses

33.7607	32.5331	31.3054	30.0777	28.8501	27.6224	27.6224	28.8501	30.0777	31.3054	32.5331	33.7607	(42c)

Average daily hot water use (litres/day) 104.1569 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.3089	110.8900	107.9440	103.4634	99.8252	95.9137	94.4099	97.3432	100.4369	104.5434	109.0930	113.0149	(44)
Energy conte	179.4535	157.9059	165.9058	141.6362	134.3839	117.9371	114.1806	120.5312	123.8488	141.8644	155.4230	176.9540	(45)
Energy content (annual)										Total = Sum(45)m =		1730.0244	
Distribution loss (46)m = 0.15 x (45)m	26.9180	23.6859	24.8859	21.2454	20.1576	17.6906	17.1271	18.0797	18.5773	21.2797	23.3134	26.5431	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)
										Total per year (kWh/year) = Sum(64)m =		2074.9494	(64)
12Total per year (kWh/year)												2075	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.6683	52.5037	55.1637	47.0940	44.6826	39.2141	37.9651	40.0766	41.1797	47.1699	51.6781	58.8372	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.6068	92.5647	83.6068	86.3937	83.6068	86.3937	83.6068	83.6068	86.3937	83.6068	86.3937	83.6068	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.8871	164.5774	160.3180	151.2502	139.8038	129.0458	121.8588	120.1685	124.4279	133.4957	144.9421	155.7001	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	(71)
Water heating gains (Table 5)	80.1993	78.1305	74.1447	65.4084	60.0573	54.4640	51.0283	53.8665	57.1940	63.4004	71.7752	79.0823	(72)
Total internal gains	377.7141	386.2934	369.0904	354.0731	334.4888	320.9243	307.5147	308.6626	319.0365	331.5237	354.1318	369.4100	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

				m2		Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W	
East				10.3300		19.6403	0.3300	0.0000		0.7700		51.5528	(76)
Solar gains	51.5528	100.8482	166.0827	242.2217	296.8517	303.8806	289.3067	248.5102	193.1610	119.6649	64.2803	42.3945	(83)
Total gains	429.2669	487.1416	535.1730	596.2948	631.3405	624.8049	596.8214	557.1728	512.1975	451.1886	418.4121	411.8045	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2247	75.4399	75.6562	76.7571	76.9811	78.1211	78.1211	78.3532	77.6611	76.9811	76.5344	76.0928	
alpha	6.0150	6.0293	6.0437	6.1171	6.1321	6.2081	6.2081	6.2235	6.1774	6.1321	6.1023	6.0729	
util living area	0.9902	0.9783	0.9478	0.8492	0.6800	0.4817	0.3484	0.3886	0.6255	0.8993	0.9782	0.9921	(86)
MIT	20.1694	20.3441	20.5773	20.8395	20.9640	20.9963	20.9996	20.9992	20.9834	20.8029	20.4482	20.1425	(87)
Th 2	20.1877	20.1898	20.1920	20.2026	20.2048	20.2155	20.2155	20.2177	20.2112	20.2048	20.2005	20.1962	(88)
util rest of house	0.9875	0.9725	0.9344	0.8172	0.6301	0.4239	0.2864	0.3229	0.5601	0.8689	0.9713	0.9899	(89)
MIT 2	19.2264	19.4476	19.7367	20.0490	20.1766	20.2135	20.2154	20.2174	20.2007	20.0180	19.5890	19.1989	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	19.6298	19.8311	20.0964	20.3872	20.5135	20.5484	20.5509	20.5519	20.5356	20.3538	19.9566	19.6026	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6298	19.8311	20.0964	20.3872	20.5135	20.5484	20.5509	20.5519	20.5356	20.3538	19.9566	19.6026	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9851	0.9694	0.9326	0.8251	0.6499	0.4485	0.3129	0.3511	0.5875	0.8751	0.9687	0.9878	(94)
Useful gains	422.8595	472.2419	499.0781	491.9963	410.3077	280.2412	186.7670	195.5967	300.9209	394.8543	405.3263	406.7935	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	752.9607	731.2849	664.0085	552.9582	423.0180	281.3365	186.8620	195.7860	306.1810	468.1507	620.6768	747.9058	(97)
Space heating kWh	245.5952	174.0769	122.7082	43.8926	9.4564	0.0000	0.0000	0.0000	0.0000	54.5325	155.0523	253.7875	(98a)
Space heating requirement - total per year (kWh/year)												1059.1018	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	245.5952	174.0769	122.7082	43.8926	9.4564	0.0000	0.0000	0.0000	0.0000	54.5325	155.0523	253.7875	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1059.1018	
Space heating per m2											(98c) / (4) =	18.8957	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	245.5952	174.0769	122.7082	43.8926	9.4564	0.0000	0.0000	0.0000	0.0000	54.5325	155.0523	253.7875	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	245.5952	174.0769	122.7082	43.8926	9.4564	0.0000	0.0000	0.0000	0.0000	54.5325	155.0523	253.7875	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	57.7188	50.9770	53.9728	47.0010	45.2570	40.4482	39.6709	41.4268	42.0828	47.3254	50.8130	57.0276	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1889	7.3964	8.1889	7.9247	8.1889	7.9247	8.1889	8.1889	7.9247	8.1889	7.9247	8.1889	(231)
Lighting	17.8625	14.3300	12.9025	9.4530	7.3017	5.9656	6.6609	8.6581	11.2460	14.7553	16.6661	18.3590	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	1059.1018	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	573.7214	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	96.4172	(230a)
Total electricity for the above, kWh/year	96.4172	(231)
Electricity for lighting (calculated in Appendix L)	144.1607	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1873.4010	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1059.1018	0.1571	166.3803	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	573.7214	0.1411	80.9531	(264)
Space and water heating			247.3333	(265)
Pumps, fans and electric keep-hot	96.4172	0.1387	13.3743	(267)
Energy for lighting	144.1607	0.1443	20.8068	(268)
Total CO2, kg/year			281.5144	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1059.1018	1.5816	1675.0356	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	573.7214	1.5218	873.0622	(278)
Space and water heating			2548.0978	(279)
Pumps, fans and electric keep-hot	96.4172	1.5128	145.8600	(281)
Energy for lighting	144.1607	1.5338	221.1185	(282)
Total Primary energy kWh/year			2915.0762	(286)
Dwelling Primary energy Rate (DPER)			52.0100	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	56.0500	(1b)	x 2.4000	(2b) =	134.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.0500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.5200	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1487	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3987	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3389	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4321	0.4236	0.4151	0.3728	0.3643	0.3219	0.3219	0.3135	0.3389	0.3643	0.3812	0.3982 (22b)
Effective ac	0.5933	0.5897	0.5862	0.5695	0.5664	0.5518	0.5518	0.5491	0.5574	0.5664	0.5727	0.5793 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.3300	1.1450	11.8282			(27)
Terrace Floor			5.8100	0.1300	0.7553			(28b)
Brickwork	25.6000	10.3300	15.2700	0.1800	2.7486			(29a)
Communal Wall	6.9900	2.0600	4.9300	0.1800	0.8874			(29a)
Lift Shaft Wall	7.9300		7.9300	0.1800	1.4274			(29a)
Stairwell Wall	10.6600		10.6600	0.1800	1.9188			(29a)
Cold Roof	56.0500		56.0500	0.1100	6.1655			(30)
Total net area of external elements Aum(A, m2)			113.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.7912			(33)
Main dwelling								
Party Wall 1			37.6600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 237.3133 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.4500	0.0700	0.5915
E18 Party wall between dwellings	8.1000	0.0600	0.4860
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0800	0.0200	0.0816
P4 Party wall - Roof (insulation at ceiling level)	13.6900	0.1200	1.6428
E10 Eaves (insulation at ceiling level)	2.4000	0.0600	0.1440
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0500	0.9245
E20 Exposed floor (normal)	6.8200	0.3200	2.1824
E12 Gable (insulation at ceiling level)	7.3500	0.0600	0.4410
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
E15 Flat roof with parapet	8.8100	0.5600	4.9336
E16 Corner (normal)	8.5500	0.0900	0.7695

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.3694 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 40.1606 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.3393	26.1784	26.0207	25.2800	25.1414	24.4962	24.4962	24.3767	24.7447	25.1414	25.4217	25.7149	(38)
Heat transfer coeff	66.5000	66.3391	66.1814	65.4406	65.3020	64.6568	64.6568	64.5373	64.9053	65.3020	65.5824	65.8755	(39)
Average = Sum(39)m / 12 =												65.4399	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1864	1.1836	1.1808	1.1675	1.1651	1.1536	1.1536	1.1514	1.1580	1.1651	1.1701	1.1753	(40)
HLP (average)												1.1675	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8681 (42)

Hot water usage for mixer showers

55.5406	54.7060	53.4897	51.1626	49.4452	47.5300	46.4414	47.6485	48.9717	51.0280	53.4051	55.3278	(42a)

Hot water usage for baths

24.0075	23.6510	23.1489	22.2231	21.5299	20.7613	20.3461	20.8447	21.3875	22.2100	23.1548	23.9264	(42b)

Hot water usage for other uses

33.7607	32.5331	31.3054	30.0777	28.8501	27.6224	27.6224	28.8501	30.0777	31.3054	32.5331	33.7607	(42c)

Average daily hot water use (litres/day) 104.1569 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.3089	110.8900	107.9440	103.4634	99.8252	95.9137	94.4099	97.3432	100.4369	104.5434	109.0930	113.0149	(44)
Energy conte	179.4535	157.9059	165.9058	141.6362	134.3839	117.9371	114.1806	120.5312	123.8488	141.8644	155.4230	176.9540	(45)
Energy content (annual)											Total = Sum(45)m =	1730.0244	
Distribution loss (46)m = 0.15 x (45)m	26.9180	23.6859	24.8859	21.2454	20.1576	17.6906	17.1271	18.0797	18.5773	21.2797	23.3134	26.5431	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

226.0484	199.9916	212.5007	186.7281	180.9788	163.0289	160.7755	167.1261	168.9406	188.4593	200.5148	223.5489	(62)
WWHRS -25.3909	-22.4559	-23.5145	-19.4709	-18.1462	-15.5278	-14.5549	-15.4777	-16.0657	-18.9397	-21.4564	-24.9207	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
200.6576	177.5357	188.9862	167.2571	162.8326	147.5011	146.2206	151.6485	152.8749	169.5196	179.0584	198.6283	(64)
									Total per year (kWh/year) = Sum(64)m =		2042.7206	(64)
12Total per year (kWh/year)											2043	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

96.9442	86.1723	92.4396	83.1675	81.9586	75.2875	75.2410	77.3526	77.2532	84.4458	87.7516	96.1131	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	83.6068	92.5647	83.6068	86.3937	83.6068	86.3937	83.6068	83.6068	86.3937	83.6068	86.3937	83.6068	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	162.8871	164.5774	160.3180	151.2502	139.8038	129.0458	121.8588	120.1685	124.4279	133.4957	144.9421	155.7001	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	(71)
Water heating gains (Table 5)													
	130.3014	128.2325	124.2468	115.5104	110.1594	104.5660	101.1303	103.9685	107.2961	113.5025	121.8772	129.1843	(72)
Total internal gains													
	430.8161	439.3954	422.1924	407.1752	387.5908	371.0264	357.6168	358.7647	369.1386	384.6258	407.2338	422.5121	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.6300	0.7000	0.7700	62.0040	(76)

Solar gains	62.0040	121.2929	199.7521	291.3266	357.0317	365.4855	347.9571	298.8900	232.3200	143.9243	77.3117	50.9890	(83)
Total gains	492.8201	560.6883	621.9445	698.5018	744.6225	736.5118	705.5738	657.6546	601.4586	528.5500	484.5455	473.5011	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.5615	55.6962	55.8289	56.4609	56.5807	57.1453	57.1453	57.2511	56.9265	56.5807	56.3389	56.0882	
alpha	4.7041	4.7131	4.7219	4.7641	4.7720	4.8097	4.8097	4.8167	4.7951	4.7720	4.7559	4.7392	
util living area													
	0.9877	0.9766	0.9505	0.8740	0.7334	0.5459	0.4001	0.4460	0.6881	0.9123	0.9762	0.9897	(86)
MIT	19.7657	19.9695	20.2700	20.6399	20.8784	20.9766	20.9957	20.9929	20.9324	20.6088	20.1294	19.7347	(87)
Th 2	19.9309	19.9332	19.9354	19.9461	19.9480	19.9573	19.9573	19.9591	19.9538	19.9480	19.9440	19.9398	(88)
util rest of house													
	0.9841	0.9699	0.9362	0.8404	0.6729	0.4636	0.3069	0.3478	0.6041	0.8805	0.9681	0.9866	(89)
MIT 2	18.5229	18.7811	19.1553	19.5998	19.8523	19.9447	19.9560	19.9566	19.9113	19.5782	18.9933	18.4902	(90)
Living area fraction									fLA = Living area / (4) =			0.4278	(91)
MIT	19.0546	19.2895	19.6322	20.0448	20.2913	20.3862	20.4008	20.4000	20.3482	20.0191	19.4794	19.0226	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0546	19.2895	19.6322	20.0448	20.2913	20.3862	20.4008	20.4000	20.3482	20.0191	19.4794	19.0226	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9801	0.9647	0.9313	0.8439	0.6937	0.4982	0.3469	0.3899	0.6373	0.8830	0.9635	0.9831	(94)
Useful gains	483.0139	540.8999	579.2163	589.4371	516.5190	366.8948	244.7434	256.4064	383.3188	466.7092	466.8594	465.4769	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	981.1820	954.5883	869.1068	729.3226	561.0282	374.1176	245.7489	258.1484	405.5405	615.0884	811.8688	976.4491	(97)
Space heating kWh													
	370.6371	277.9986	215.6785	100.7176	33.1149	0.0000	0.0000	0.0000	0.0000	110.3941	248.4068	380.1633	(98a)
Space heating requirement - total per year (kWh/year)												1737.1108	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	370.6371	277.9986	215.6785	100.7176	33.1149	0.0000	0.0000	0.0000	0.0000	110.3941	248.4068	380.1633	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1737.1108	
Space heating per m2											(98c) / (4) =	30.9922	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	370.6371	277.9986	215.6785	100.7176	33.1149	0.0000	0.0000	0.0000	0.0000	110.3941	248.4068	380.1633	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	401.5570	301.1902	233.6712	109.1198	35.8774	0.0000	0.0000	0.0000	0.0000	119.6036	269.1298	411.8779	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	200.6576	177.5357	188.9862	167.2571	162.8326	147.5011	146.2206	151.6485	152.8749	169.5196	179.0584	198.6283	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4164	85.0612	84.3568	82.9602	81.1907	79.8000	79.8000	79.8000	79.8000	83.1225	84.7941	85.4911	(217)
Fuel for water heating, kWh/month													
	234.9169	208.7153	224.0320	201.6114	200.5558	184.8384	183.2339	190.0357	191.5726	203.9394	211.1685	232.3379	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	17.3719	13.9363	12.5481	9.1933	7.1012	5.8017	6.4779	8.4203	10.9371	14.3500	16.2083	17.8547	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.1328	-22.4824	-34.0405	-40.3931	-45.4393	-43.1221	-42.6137	-39.3003	-33.7757	-26.6446	-17.0453	-12.9539	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.3843	-11.5826	-23.5003	-36.0034	-48.2951	-48.7625	-48.1717	-40.4558	-29.2327	-16.7756	-7.2574	-4.2378	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1882.0269	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2466.9577	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	140.2008	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-692.6029	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3882.5824	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1882.0269	0.2100	395.2256	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2466.9577	0.2100	518.0611	(264)
Space and water heating			913.2868	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	140.2008	0.1443	20.2353	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-372.9438	0.1335	-49.7823	
PV Unit electricity exported	-319.6591	0.1253	-40.0621	
Total			-89.8444	(269)
Total CO2, kg/year			855.6069	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1882.0269	1.1300	2126.6904	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2466.9577	1.1300	2787.6622	(278)
Space and water heating			4914.3525	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	140.2008	1.5338	215.0446	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-372.9438	1.4933	-556.9072	
PV Unit electricity exported	-319.6591	0.4600	-147.0471	
Total			-703.9543	(283)
Total Primary energy kWh/year			4555.5436	(286)
Target Primary Energy Rate (TPER)			81.2800	(287)

Full SAP Calculation Printout

Plot Reference	P-29	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-29
Plot Address	Flat 9, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	83 B	**DER**	5.02	**TER**	15.27
Environmental	97 A	**% DER < TER**			67.13
CO_2 Emissions (t/year)	0.23	**DFEE**	35.01	**TFEE**	39.60
Compliance Check	See BREL	**% DFEE < TFEE**			11.58
% DPER < TPER	36.01	**DPER**	52.01	**TPER**	81.28

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	56.0500	(1b)	x 2.4000	(2b) =	134.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.0500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	134.5200	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1487	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9700	(17)
Infiltration rate		0.2972	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2526	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3221	0.3158	0.3094	0.2779	0.2715	0.2400	0.2400	0.2337	0.2526	0.2715	0.2842	0.2968	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5519	0.5498	0.5479	0.5386	0.5369	0.5288	0.5288	0.5273	0.5319	0.5369	0.5404	0.5440	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			10.3300	1.1450	11.8282			(27)
Terrace Floor			5.8100	0.1400	0.8134	0.0000	0.0000	(28b)
Brickwork	25.6000	10.3300	15.2700	0.2100	3.2067	110.0000	1679.7000	(29a)
Communal Wall	6.9900	2.0600	4.9300	0.2200	1.0846	110.0000	542.3000	(29a)
Lift Shaft Wall	7.9300		7.9300	0.1600	1.2688	110.0000	872.3000	(29a)
Stairwell Wall	10.6600		10.6600	0.1600	1.7056	110.0000	1172.6000	(29a)
Cold Roof	56.0500		56.0500	0.0900	5.0445	9.0000	504.4500	(30)
Total net area of external elements Aum(A, m2)			113.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.4238			(33)
Main dwelling								
Party Wall 1			37.6600	0.0000	0.0000	110.0000	4142.6000	(32)
Party Floor 1			50.2400			70.0000	3516.8000	(32d)
Internal Wall 1			96.7400			9.0000	870.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 13301.4099	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	237.3133	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.4500	0.0380	0.3211
E18 Party wall between dwellings	8.1000	0.0380	0.3078
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0800	0.3300	1.3464
P4 Party wall - Roof (insulation at ceiling level)	13.6900	0.1010	1.3827
E10 Eaves (insulation at ceiling level)	2.4000	0.1200	0.2880
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	6.8200	0.1200	0.8184
E12 Gable (insulation at ceiling level)	7.3500	0.0770	0.5659
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0970	-0.2619
E25 Staggered party wall between dwellings	2.5000	0.0310	0.0775
E15 Flat roof with parapet	8.8100	0.3000	2.6430
E16 Corner (normal)	8.5500	0.0540	0.4617

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.9358 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.4981	24.4087	24.3211	23.9095	23.8324	23.4740	23.4740	23.4076	23.6120	23.8324	23.9882	24.1511	(38)
Heat transfer coeff	60.4339	60.3445	60.2569	59.8453	59.7683	59.4098	59.4098	59.3434	59.5479	59.7683	59.9241	60.0869	(39)
Average = Sum(39)m / 12 =												59.8449	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0782	1.0766	1.0751	1.0677	1.0663	1.0599	1.0599	1.0588	1.0624	1.0663	1.0691	1.0720	(40)
HLP (average)												1.0677	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8681 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

24.0075	23.6510	23.1489	22.2231	21.5299	20.7613	20.3461	20.8447	21.3875	22.2100	23.1548	23.9264	(42b)

Hot water usage for other uses

33.7607	32.5331	31.3054	30.0777	28.8501	27.6224	27.6224	28.8501	30.0777	31.3054	32.5331	33.7607	(42c)

Average daily hot water use (litres/day) 52.9503 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.7682	56.1840	54.4543	52.3008	50.3800	48.3837	47.9685	49.6947	51.4652	53.5154	55.6879	57.6871	(44)
Energy conte	91.4908	80.0053	83.6942	71.5972	67.8211	59.4934	58.0137	61.5324	63.4618	72.6199	79.3376	90.3240	(45)
Energy content (annual)											Total = Sum(45)m =	879.3915	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

77.7671	68.0045	71.1401	60.8577	57.6480	50.5694	49.3117	52.3026	53.9425	61.7269	67.4370	76.7754	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

77.7671	68.0045	71.1401	60.8577	57.6480	50.5694	49.3117	52.3026	53.9425	61.7269	67.4370	76.7754	(64)

Total per year (kWh/year) = Sum(64)m = 747.4827 (64)
12Total per year (kWh/year) 747 (64)
Electric shower(s)

44.4788	39.6310	43.2755	41.2973	42.0722	40.1328	41.4706	42.0722	41.2973	43.2755	42.4617	44.4788	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 505.9436 (64a)
Heat gains from water heating, kWh/month

30.5615	26.9089	28.6039	25.5387	24.9300	22.6755	22.6956	23.5937	23.8099	26.2506	27.4747	30.3135	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.6068	92.5647	83.6068	86.3937	83.6068	86.3937	83.6068	83.6068	86.3937	83.6068	86.3937	83.6068	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.8871	164.5774	160.3180	151.2502	139.8038	129.0458	121.8588	120.1685	124.4279	133.4957	144.9421	155.7001	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	(71)
Water heating gains (Table 5)	41.0773	40.0430	38.4461	35.4705	33.5081	31.4938	30.5048	31.7120	33.0694	35.2831	38.1593	40.7440	(72)
Total internal gains	338.5920	348.2058	333.3917	324.1352	307.9396	297.9541	286.9912	286.5081	294.9118	303.4064	320.5159	331.0717	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.3300	0.0000	0.7700	51.5528	(76)

Solar gains	51.5528	100.8482	166.0827	242.2217	296.8517	303.8806	289.3067	248.5102	193.1610	119.6649	64.2803	42.3945	(83)

Total gains	390.1448	449.0541	499.4744	566.3569	604.7913	601.8347	576.2979	535.0183	488.0728	423.0713	384.7962	373.4663	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.1385	61.2290	61.3181	61.7398	61.8194	62.1924	62.1924	62.2620	62.0482	61.8194	61.6586	61.4915	
alpha	5.0759	5.0819	5.0879	5.1160	5.1213	5.1462	5.1462	5.1508	5.1365	5.1213	5.1106	5.0994	
util living area													
	0.9951	0.9893	0.9742	0.9203	0.7994	0.6085	0.4493	0.5023	0.7575	0.9508	0.9895	0.9960	(86)
MIT	19.7455	19.9345	20.2176	20.5893	20.8535	20.9716	20.9950	20.9914	20.9166	20.5559	20.0850	19.7108	(87)
Th 2	20.0187	20.0200	20.0213	20.0273	20.0284	20.0337	20.0337	20.0347	20.0317	20.0284	20.0261	20.0237	(88)
util rest of house													
	0.9935	0.9860	0.9662	0.8961	0.7459	0.5261	0.3529	0.4009	0.6797	0.9306	0.9857	0.9948	(89)
MIT 2	18.8828	19.0710	19.3499	19.7067	19.9340	20.0211	20.0324	20.0322	19.9881	19.6846	19.2263	18.8522	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	19.2519	19.4404	19.7211	20.0843	20.3274	20.4278	20.4442	20.4426	20.3854	20.0574	19.5937	19.2195	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2519	19.4404	19.7211	20.0843	20.3274	20.4278	20.4442	20.4426	20.3854	20.0574	19.5937	19.2195	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9920	0.9835	0.9632	0.8977	0.7635	0.5606	0.3942	0.4444	0.7100	0.9313	0.9835	0.9935	(94)
Useful gains	387.0046	441.6419	481.0780	508.4376	461.7515	337.3841	227.2041	237.7600	346.5177	394.0050	378.4556	371.0214	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	903.6021	877.4353	796.6627	669.3277	515.6423	346.2260	228.3853	239.9009	374.2801	565.2519	748.6706	902.4786	(97)
Space heating kWh													
	384.3485	292.8532	234.7950	115.8409	40.0948	0.0000	0.0000	0.0000	0.0000	127.4077	266.5548	395.4042	(98a)
Space heating requirement - total per year (kWh/year)												1857.2991	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	384.3485	292.8532	234.7950	115.8409	40.0948	0.0000	0.0000	0.0000	0.0000	127.4077	266.5548	395.4042	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1857.2991	
Space heating per m2											(98c) / (4) =	33.1365	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	558.4520	439.6324	451.0098	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9041	0.9508	0.9299	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	504.8818	417.9852	419.3977	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	672.0372	643.8761	597.2463	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.3519	168.0628	132.3193	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	30.0880	42.0157	33.0798	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												105.1835	(107)
Energy for space heating												33.1365	(99)
Energy for space cooling												1.8766	(108)
Total												35.0131	(109)
Fabric Energy Efficiency (DFEE)												35.0	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		56.0500	(1b)	x 2.4000	(2b) =	134.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.0500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		134.5200	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)

Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1487 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3987 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3389 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4321	0.4236	0.4151	0.3728	0.3643	0.3219	0.3219	0.3135	0.3389	0.3643	0.3812	0.3982	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5933	0.5897	0.5862	0.5695	0.5664	0.5518	0.5518	0.5491	0.5574	0.5664	0.5727	0.5793	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.3300	1.1450	11.8282			(27)
Terrace Floor			5.8100	0.1300	0.7553			(28b)
Brickwork	25.6000	10.3300	15.2700	0.1800	2.7486			(29a)
Communal Wall	6.9900	2.0600	4.9300	0.1800	0.8874			(29a)
Lift Shaft Wall	7.9300		7.9300	0.1800	1.4274			(29a)
Stairwell Wall	10.6600		10.6600	0.1800	1.9188			(29a)
Cold Roof	56.0500		56.0500	0.1100	6.1655			(30)
Total net area of external elements Aum(A, m2)			113.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.7912			(33)
Main dwelling								
Party Wall 1			37.6600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	237.3133 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.4500	0.0700	0.5915
E18 Party wall between dwellings	8.1000	0.0600	0.4860
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0800	0.0200	0.0816
P4 Party wall - Roof (insulation at ceiling level)	13.6900	0.1200	1.6428
E10 Eaves (insulation at ceiling level)	2.4000	0.0600	0.1440
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0500	0.9245
E20 Exposed floor (normal)	6.8200	0.3200	2.1824
E12 Gable (insulation at ceiling level)	7.3500	0.0600	0.4410
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
E15 Flat roof with parapet	8.8100	0.5600	4.9336
E16 Corner (normal)	8.5500	0.0900	0.7695

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.3694 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.1606 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.3393	26.1784	26.0207	25.2800	25.1414	24.4962	24.4962	24.3767	24.7447	25.1414	25.4217	25.7149	(38)
Heat transfer coeff	66.5000	66.3391	66.1814	65.4406	65.3020	64.6568	64.6568	64.5373	64.9053	65.3020	65.5824	65.8755	(39)
Average = Sum(39)m / 12 =												65.4399	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1864	1.1836	1.1808	1.1675	1.1651	1.1536	1.1536	1.1514	1.1580	1.1651	1.1701	1.1753	(40)
HLP (average)												1.1675	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.8681 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

24.0075	23.6510	23.1489	22.2231	21.5299	20.7613	20.3461	20.8447	21.3875	22.2100	23.1548	23.9264	(42b)

Hot water usage for other uses

33.7607	32.5331	31.3054	30.0777	28.8501	27.6224	27.6224	28.8501	30.0777	31.3054	32.5331	33.7607	(42c)

Average daily hot water use (litres/day)		52.9503 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.7682	56.1840	54.4543	52.3008	50.3800	48.3837	47.9685	49.6947	51.4652	53.5154	55.6879	57.6871	(44)
Energy conte	91.4908	80.0053	83.6942	71.5972	67.8211	59.4934	58.0137	61.5324	63.4618	72.6199	79.3376	90.3240	(45)
Energy content (annual)										Total = Sum(45)m =		879.3915	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	77.7671	68.0045	71.1401	60.8577	57.6480	50.5694	49.3117	52.3026	53.9425	61.7269	67.4370	76.7754	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	77.7671	68.0045	71.1401	60.8577	57.6480	50.5694	49.3117	52.3026	53.9425	61.7269	67.4370	76.7754	(64)
											Total per year (kWh/year) = Sum(64)m =	747.4827	(64)
12Total per year (kWh/year)												747	(64)
Electric shower(s)													
	44.4788	39.6310	43.2755	41.2973	42.0722	40.1328	41.4706	42.0722	41.2973	43.2755	42.4617	44.4788	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	505.9436	(64a)
Heat gains from water heating, kWh/month													
	30.5615	26.9089	28.6039	25.5387	24.9300	22.6755	22.6956	23.5937	23.8099	26.2506	27.4747	30.3135	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	83.6068	92.5647	83.6068	86.3937	83.6068	86.3937	83.6068	83.6068	86.3937	83.6068	86.3937	83.6068	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	162.8871	164.5774	160.3180	151.2502	139.8038	129.0458	121.8588	120.1685	124.4279	133.4957	144.9421	155.7001	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	(71)
Water heating gains (Table 5)													
	41.0773	40.0430	38.4461	35.4705	33.5081	31.4938	30.5048	31.7120	33.0694	35.2831	38.1593	40.7440	(72)
Total internal gains													
	338.5920	348.2058	333.3917	324.1352	307.9396	297.9541	286.9912	286.5081	294.9118	303.4064	320.5159	331.0717	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.6300	0.7000	0.7700	62.0040	(76)
Solar gains	62.0040	121.2929	199.7521	291.3266	357.0317	365.4855	347.9571	298.8900	232.3200	143.9243	77.3117	50.9890	(83)
Total gains	400.5960	469.4987	533.1438	615.4618	664.9712	663.4396	634.9483	585.3981	527.2318	447.3306	397.8275	382.0608	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	55.5615	55.6962	55.8289	56.4609	56.5807	57.1453	57.1453	57.2511	56.9265	56.5807	56.3389	56.0882	
alpha	4.7041	4.7131	4.7219	4.7641	4.7720	4.8097	4.8097	4.8167	4.7951	4.7720	4.7559	4.7392	
util living area													
	0.9947	0.9882	0.9713	0.9125	0.7873	0.5978	0.4428	0.4974	0.7538	0.9489	0.9890	0.9958	(86)
MIT	19.5910	19.8040	20.1249	20.5428	20.8335	20.9658	20.9934	20.9887	20.8997	20.4940	19.9715	19.5599	(87)
Th 2	19.9309	19.9332	19.9354	19.9461	19.9480	19.9573	19.9573	19.9591	19.9538	19.9480	19.9440	19.9398	(88)
util rest of house													
	0.9930	0.9846	0.9622	0.8857	0.7300	0.5109	0.3406	0.3897	0.6714	0.9273	0.9849	0.9944	(89)
MIT 2	18.6612	18.8739	19.1902	19.5931	19.8424	19.9425	19.9557	19.9560	19.9021	19.5594	19.0498	18.6371	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	19.0590	19.2718	19.5901	19.9994	20.2664	20.3803	20.3996	20.3978	20.3289	19.9592	19.4441	19.0319	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0590	19.2718	19.5901	19.9994	20.2664	20.3803	20.3996	20.3978	20.3289	19.9592	19.4441	19.0319	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9912	0.9817	0.9586	0.8873	0.7485	0.5472	0.3844	0.4359	0.7031	0.9276	0.9824	0.9929	(94)
Useful gains	397.0736	460.8926	511.0550	546.0848	497.7536	363.0276	244.1019	255.1958	370.6839	414.9375	390.8139	379.3311	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	981.4718	953.4148	866.3213	726.3520	559.4026	373.7362	245.6730	258.0082	404.2905	611.1767	809.5578	977.0592	(97)
Space heating kWh													
	434.7923	330.9750	264.3182	129.7924	45.8668	0.0000	0.0000	0.0000	0.0000	146.0020	301.4956	444.7097	(98a)
Space heating requirement - total per year (kWh/year)												2097.9519	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	434.7923	330.9750	264.3182	129.7924	45.8668	0.0000	0.0000	0.0000	0.0000	146.0020	301.4956	444.7097	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2097.9519	
Space heating per m2											(98c) / (4) =	37.4300	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	607.7741	478.4604	490.4838	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8999	0.9463	0.9238	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	546.9134	452.7593	453.1169	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	744.0430	712.4284	656.1317	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	141.9333	193.1939	151.0431	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													

	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	35.4833	48.2985	37.7608	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												121.5425 (107)
Energy for space heating												37.4300 (99)
Energy for space cooling												2.1685 (108)
Total												39.5985 (109)
Fabric Energy Efficiency (TFEE)												39.6 (109)

Full SAP Calculation Printout

Plot Reference	P-29	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-29
Plot Address	Flat 9, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	83 B	**DER**	5.02	**TER**	15.27
Environmental	97 A	**% DER < TER**			67.13
CO_2 Emissions (t/year)	0.23	**DFEE**	35.01	**TFEE**	39.60
Compliance Check	See BREL	**% DFEE < TFEE**			11.58
% DPER < TPER	36.01	**DPER**	52.01	**TPER**	81.28

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	56.0500 (1b)	x	2.4000 (2b)	=	134.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.0500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.5200	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

Effective ac	0.2969	0.2938	0.2906	0.2748	0.2717	0.2559	0.2559	0.2528	0.2622	0.2717	0.2780	0.2843	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			10.3300	1.1450	11.8282			(27)
Terrace Floor			5.8100	0.1400	0.8134	0.0000	0.0000	(28b)
Brickwork	25.6000	10.3300	15.2700	0.2100	3.2067	110.0000	1679.7000	(29a)
Communal Wall	6.9900	2.0600	4.9300	0.2200	1.0846	110.0000	542.3000	(29a)
Lift Shaft Wall	7.9300		7.9300	0.1600	1.2688	110.0000	872.3000	(29a)
Stairwell Wall	10.6600		10.6600	0.1600	1.7056	110.0000	1172.6000	(29a)
Cold Roof	56.0500		56.0500	0.0900	5.0445	9.0000	504.4500	(30)
Total net area of external elements Aum(A, m2)			113.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.4238			(33)
Main dwelling								
Party Wall 1			37.6600	0.0000	0.0000	110.0000	4142.6000	(32)
Party Floor 1			50.2400			70.0000	3516.8000	(32d)
Internal Wall 1			96.7400			9.0000	870.6600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13301.4099 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 237.3133 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	8.4500	0.0380	0.3211
E18 Party wall between dwellings	8.1000	0.0380	0.3078
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0800	0.3300	1.3464
P4 Party wall - Roof (insulation at ceiling level)	13.6900	0.1010	1.3827
E10 Eaves (insulation at ceiling level)	2.4000	0.1200	0.2880
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	6.8200	0.1200	0.8184
E12 Gable (insulation at ceiling level)	7.3500	0.0770	0.5659
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0970	-0.2619
E25 Staggered party wall between dwellings	2.5000	0.0310	0.0775
E15 Flat roof with parapet	8.8100	0.3000	2.6430
E16 Corner (normal)	8.5500	0.0540	0.4617

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.9358 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.1815	13.0414	12.9013	12.2009	12.0608	11.3604	11.3604	11.2203	11.6406	12.0608	12.3410	12.6212	(38)
Heat transfer coeff	49.1173	48.9772	48.8372	48.1367	47.9967	47.2962	47.2962	47.1562	47.5764	47.9967	48.2768	48.5570	(39)
Average = Sum(39)m / 12 =												48.1017	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8763	0.8738	0.8713	0.8588	0.8563	0.8438	0.8438	0.8413	0.8488	0.8563	0.8613	0.8663	(40)
HLP (average)												0.8582	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8681 (42)
Hot water usage for mixer showers

55.5406	54.7060	53.4897	51.1626	49.4452	47.5300	46.4414	47.6485	48.9717	51.0280	53.4051	55.3278	(42a)

Hot water usage for baths

24.0075	23.6510	23.1489	22.2231	21.5299	20.7613	20.3461	20.8447	21.3875	22.2100	23.1548	23.9264	(42b)

Hot water usage for other uses

33.7607	32.5331	31.3054	30.0777	28.8501	27.6224	27.6224	28.8501	30.0777	31.3054	32.5331	33.7607	(42c)

Average daily hot water use (litres/day) 104.1569 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.3089	110.8900	107.9440	103.4634	99.8252	95.9137	94.4099	97.3432	100.4369	104.5434	109.0930	113.0149	(44)
Energy conte	179.4535	157.9059	165.9058	141.6362	134.3839	117.9371	114.1806	120.5312	123.8488	141.8644	155.4230	176.9540	(45)
Energy content (annual)										Total = Sum(45)m =		1730.0244	
Distribution loss (46)m = 0.15 x (45)m	26.9180	23.6859	24.8859	21.2454	20.1576	17.6906	17.1271	18.0797	18.5773	21.2797	23.3134	26.5431	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)
										Total per year (kWh/year) = Sum(64)m =		2074.9494	(64)
12Total per year (kWh/year)												2075	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.6683	52.5037	55.1637	47.0940	44.6826	39.2141	37.9651	40.0766	41.1797	47.1699	51.6781	58.8372	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.6068	92.5647	83.6068	86.3937	83.6068	86.3937	83.6068	83.6068	86.3937	83.6068	86.3937	83.6068	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.8871	164.5774	160.3180	151.2502	139.8038	129.0458	121.8588	120.1685	124.4279	133.4957	144.9421	155.7001	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	(71)
Water heating gains (Table 5)	80.1993	78.1305	74.1447	65.4084	60.0573	54.4640	51.0283	53.8665	57.1940	63.4004	71.7752	79.0823	(72)
Total internal gains	377.7141	386.2934	369.0904	354.0731	334.4888	320.9243	307.5147	308.6626	319.0365	331.5237	354.1318	369.4100	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

				m2		Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W	
East				10.3300		19.6403	0.3300	0.0000		0.7700		51.5528	(76)
Solar gains	51.5528	100.8482	166.0827	242.2217	296.8517	303.8806	289.3067	248.5102	193.1610	119.6649	64.2803	42.3945	(83)
Total gains	429.2669	487.1416	535.1730	596.2948	631.3405	624.8049	596.8214	557.1728	512.1975	451.1886	418.4121	411.8045	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2247	75.4399	75.6562	76.7571	76.9811	78.1211	78.1211	78.3532	77.6611	76.9811	76.5344	76.0928	
alpha	6.0150	6.0293	6.0437	6.1171	6.1321	6.2081	6.2081	6.2235	6.1774	6.1321	6.1023	6.0729	
util living area	0.9902	0.9783	0.9478	0.8492	0.6800	0.4817	0.3484	0.3886	0.6255	0.8993	0.9782	0.9921	(86)
MIT	20.1694	20.3441	20.5773	20.8395	20.9640	20.9963	20.9996	20.9992	20.9834	20.8029	20.4482	20.1425	(87)
Th 2	20.1877	20.1898	20.1920	20.2026	20.2048	20.2155	20.2155	20.2177	20.2112	20.2048	20.2005	20.1962	(88)
util rest of house	0.9875	0.9725	0.9344	0.8172	0.6301	0.4239	0.2864	0.3229	0.5601	0.8689	0.9713	0.9899	(89)
MIT 2	19.2264	19.4476	19.7367	20.0490	20.1766	20.2135	20.2154	20.2174	20.2007	20.0180	19.5890	19.1989	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	19.6298	19.8311	20.0964	20.3872	20.5135	20.5484	20.5509	20.5519	20.5356	20.3538	19.9566	19.6026	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6298	19.8311	20.0964	20.3872	20.5135	20.5484	20.5509	20.5519	20.5356	20.3538	19.9566	19.6026	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9851	0.9694	0.9326	0.8251	0.6499	0.4485	0.3129	0.3511	0.5875	0.8751	0.9687	0.9878	(94)
Useful gains	422.8595	472.2419	499.0781	491.9963	410.3077	280.2412	186.7670	195.5967	300.9209	394.8543	405.3263	406.7935	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	752.9607	731.2849	664.0085	552.9582	423.0180	281.3365	186.8620	195.7860	306.1810	468.1507	620.6768	747.9058	(97)
Space heating kWh	245.5952	174.0769	122.7082	43.8926	9.4564	0.0000	0.0000	0.0000	0.0000	54.5325	155.0523	253.7875	(98a)
Space heating requirement - total per year (kWh/year)												1059.1018	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	245.5952	174.0769	122.7082	43.8926	9.4564	0.0000	0.0000	0.0000	0.0000	54.5325	155.0523	253.7875	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1059.1018	
Space heating per m2											(98c) / (4) =	18.8957	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	245.5952	174.0769	122.7082	43.8926	9.4564	0.0000	0.0000	0.0000	0.0000	54.5325	155.0523	253.7875	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	245.5952	174.0769	122.7082	43.8926	9.4564	0.0000	0.0000	0.0000	0.0000	54.5325	155.0523	253.7875	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	57.7188	50.9770	53.9728	47.0010	45.2570	40.4482	39.6709	41.4268	42.0828	47.3254	50.8130	57.0276	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1889	7.3964	8.1889	7.9247	8.1889	7.9247	8.1889	8.1889	7.9247	8.1889	7.9247	8.1889	(231)
Lighting	17.8625	14.3300	12.9025	9.4530	7.3017	5.9656	6.6609	8.6581	11.2460	14.7553	16.6661	18.3590	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	1059.1018	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	573.7214	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	96.4172	(230a)
Total electricity for the above, kWh/year	96.4172	(231)
Electricity for lighting (calculated in Appendix L)	144.1607	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1873.4010	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1059.1018	0.1571	166.3803	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	573.7214	0.1411	80.9531	(264)
Space and water heating			247.3333	(265)
Pumps, fans and electric keep-hot	96.4172	0.1387	13.3743	(267)
Energy for lighting	144.1607	0.1443	20.8068	(268)
Total CO2, kg/year			281.5144	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1059.1018	1.5816	1675.0356	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	573.7214	1.5218	873.0622	(278)
Space and water heating			2548.0978	(279)
Pumps, fans and electric keep-hot	96.4172	1.5128	145.8600	(281)
Energy for lighting	144.1607	1.5338	221.1185	(282)
Total Primary energy kWh/year			2915.0762	(286)
Dwelling Primary energy Rate (DPER)			52.0100	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	56.0500	(1b)	x 2.4000	(2b) =	134.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.0500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.5200	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1487	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3987	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3389	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4321	0.4236	0.4151	0.3728	0.3643	0.3219	0.3219	0.3135	0.3389	0.3643	0.3812	0.3982 (22b)
Effective ac	0.5933	0.5897	0.5862	0.5695	0.5664	0.5518	0.5518	0.5491	0.5574	0.5664	0.5727	0.5793 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.3300	1.1450	11.8282			(27)
Terrace Floor			5.8100	0.1300	0.7553			(28b)
Brickwork	25.6000	10.3300	15.2700	0.1800	2.7486			(29a)
Communal Wall	6.9900	2.0600	4.9300	0.1800	0.8874			(29a)
Lift Shaft Wall	7.9300		7.9300	0.1800	1.4274			(29a)
Stairwell Wall	10.6600		10.6600	0.1800	1.9188			(29a)
Cold Roof	56.0500		56.0500	0.1100	6.1655			(30)
Total net area of external elements Aum(A, m2)			113.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.7912			(33)
Main dwelling								
Party Wall 1			37.6600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 237.3133 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.4500	0.0700	0.5915
E18 Party wall between dwellings	8.1000	0.0600	0.4860
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0800	0.0200	0.0816
P4 Party wall - Roof (insulation at ceiling level)	13.6900	0.1200	1.6428
E10 Eaves (insulation at ceiling level)	2.4000	0.0600	0.1440
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0500	0.9245
E20 Exposed floor (normal)	6.8200	0.3200	2.1824
E12 Gable (insulation at ceiling level)	7.3500	0.0600	0.4410
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0900	-0.2430
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
E15 Flat roof with parapet	8.8100	0.5600	4.9336
E16 Corner (normal)	8.5500	0.0900	0.7695

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.3694 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 40.1606 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.3393	26.1784	26.0207	25.2800	25.1414	24.4962	24.4962	24.3767	24.7447	25.1414	25.4217	25.7149	(38)
Heat transfer coeff	66.5000	66.3391	66.1814	65.4406	65.3020	64.6568	64.6568	64.5373	64.9053	65.3020	65.5824	65.8755	(39)
Average = Sum(39)m / 12 =												65.4399	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1864	1.1836	1.1808	1.1675	1.1651	1.1536	1.1536	1.1514	1.1580	1.1651	1.1701	1.1753	(40)
HLP (average)												1.1675	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8681 (42)

Hot water usage for mixer showers

55.5406	54.7060	53.4897	51.1626	49.4452	47.5300	46.4414	47.6485	48.9717	51.0280	53.4051	55.3278	(42a)

Hot water usage for baths

24.0075	23.6510	23.1489	22.2231	21.5299	20.7613	20.3461	20.8447	21.3875	22.2100	23.1548	23.9264	(42b)

Hot water usage for other uses

33.7607	32.5331	31.3054	30.0777	28.8501	27.6224	27.6224	28.8501	30.0777	31.3054	32.5331	33.7607	(42c)

Average daily hot water use (litres/day) 104.1569 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.3089	110.8900	107.9440	103.4634	99.8252	95.9137	94.4099	97.3432	100.4369	104.5434	109.0930	113.0149	(44)
Energy conte	179.4535	157.9059	165.9058	141.6362	134.3839	117.9371	114.1806	120.5312	123.8488	141.8644	155.4230	176.9540	(45)
Energy content (annual)											Total = Sum(45)m =	1730.0244	
Distribution loss (46)m = 0.15 x (45)m	26.9180	23.6859	24.8859	21.2454	20.1576	17.6906	17.1271	18.0797	18.5773	21.2797	23.3134	26.5431	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

226.0484	199.9916	212.5007	186.7281	180.9788	163.0289	160.7755	167.1261	168.9406	188.4593	200.5148	223.5489	(62)
WWHRS -25.3909	-22.4559	-23.5145	-19.4709	-18.1462	-15.5278	-14.5549	-15.4777	-16.0657	-18.9397	-21.4564	-24.9207	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
200.6576	177.5357	188.9862	167.2571	162.8326	147.5011	146.2206	151.6485	152.8749	169.5196	179.0584	198.6283	(64)
									Total per year (kWh/year) = Sum(64)m =		2042.7206	(64)
12Total per year (kWh/year)											2043	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

96.9442	86.1723	92.4396	83.1675	81.9586	75.2875	75.2410	77.3526	77.2532	84.4458	87.7516	96.1131	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	93.4026	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	83.6068	92.5647	83.6068	86.3937	83.6068	86.3937	83.6068	83.6068	86.3937	83.6068	86.3937	83.6068	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	162.8871	164.5774	160.3180	151.2502	139.8038	129.0458	121.8588	120.1685	124.4279	133.4957	144.9421	155.7001	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	32.3403	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	(71)
Water heating gains (Table 5)													
	130.3014	128.2325	124.2468	115.5104	110.1594	104.5660	101.1303	103.9685	107.2961	113.5025	121.8772	129.1843	(72)
Total internal gains													
	430.8161	439.3954	422.1924	407.1752	387.5908	371.0264	357.6168	358.7647	369.1386	384.6258	407.2338	422.5121	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.6300	0.7000	0.7700	62.0040	(76)

Solar gains	62.0040	121.2929	199.7521	291.3266	357.0317	365.4855	347.9571	298.8900	232.3200	143.9243	77.3117	50.9890	(83)
Total gains	492.8201	560.6883	621.9445	698.5018	744.6225	736.5118	705.5738	657.6546	601.4586	528.5500	484.5455	473.5011	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.5615	55.6962	55.8289	56.4609	56.5807	57.1453	57.1453	57.2511	56.9265	56.5807	56.3389	56.0882	
alpha	4.7041	4.7131	4.7219	4.7641	4.7720	4.8097	4.8097	4.8167	4.7951	4.7720	4.7559	4.7392	
util living area													
	0.9877	0.9766	0.9505	0.8740	0.7334	0.5459	0.4001	0.4460	0.6881	0.9123	0.9762	0.9897	(86)
MIT	19.7657	19.9695	20.2700	20.6399	20.8784	20.9766	20.9957	20.9929	20.9324	20.6088	20.1294	19.7347	(87)
Th 2	19.9309	19.9332	19.9354	19.9461	19.9480	19.9573	19.9573	19.9591	19.9538	19.9480	19.9440	19.9398	(88)
util rest of house													
	0.9841	0.9699	0.9362	0.8404	0.6729	0.4636	0.3069	0.3478	0.6041	0.8805	0.9681	0.9866	(89)
MIT 2	18.5229	18.7811	19.1553	19.5998	19.8523	19.9447	19.9560	19.9566	19.9113	19.5782	18.9933	18.4902	(90)
Living area fraction									fLA = Living area / (4) =			0.4278	(91)
MIT	19.0546	19.2895	19.6322	20.0448	20.2913	20.3862	20.4008	20.4000	20.3482	20.0191	19.4794	19.0226	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0546	19.2895	19.6322	20.0448	20.2913	20.3862	20.4008	20.4000	20.3482	20.0191	19.4794	19.0226	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9801	0.9647	0.9313	0.8439	0.6937	0.4982	0.3469	0.3899	0.6373	0.8830	0.9635	0.9831	(94)
Useful gains	483.0139	540.8999	579.2163	589.4371	516.5190	366.8948	244.7434	256.4064	383.3188	466.7092	466.8594	465.4769	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	981.1820	954.5883	869.1068	729.3226	561.0282	374.1176	245.7489	258.1484	405.5405	615.0884	811.8688	976.4491	(97)
Space heating kWh													
	370.6371	277.9986	215.6785	100.7176	33.1149	0.0000	0.0000	0.0000	0.0000	110.3941	248.4068	380.1633	(98a)
Space heating requirement - total per year (kWh/year)												1737.1108	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	370.6371	277.9986	215.6785	100.7176	33.1149	0.0000	0.0000	0.0000	0.0000	110.3941	248.4068	380.1633	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1737.1108	
Space heating per m2											(98c) / (4) =	30.9922	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	370.6371	277.9986	215.6785	100.7176	33.1149	0.0000	0.0000	0.0000	0.0000	110.3941	248.4068	380.1633	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	401.5570	301.1902	233.6712	109.1198	35.8774	0.0000	0.0000	0.0000	0.0000	119.6036	269.1298	411.8779	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	200.6576	177.5357	188.9862	167.2571	162.8326	147.5011	146.2206	151.6485	152.8749	169.5196	179.0584	198.6283	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4164	85.0612	84.3568	82.9602	81.1907	79.8000	79.8000	79.8000	79.8000	83.1225	84.7941	85.4911	(217)
Fuel for water heating, kWh/month													
	234.9169	208.7153	224.0320	201.6114	200.5558	184.8384	183.2339	190.0357	191.5726	203.9394	211.1685	232.3379	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	17.3719	13.9363	12.5481	9.1933	7.1012	5.8017	6.4779	8.4203	10.9371	14.3500	16.2083	17.8547	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.1328	-22.4824	-34.0405	-40.3931	-45.4393	-43.1221	-42.6137	-39.3003	-33.7757	-26.6446	-17.0453	-12.9539	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.3843	-11.5826	-23.5003	-36.0034	-48.2951	-48.7625	-48.1717	-40.4558	-29.2327	-16.7756	-7.2574	-4.2378	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1882.0269	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2466.9577	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	140.2008	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-692.6029	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3882.5824	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1882.0269	0.2100	395.2256	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2466.9577	0.2100	518.0611	(264)
Space and water heating			913.2868	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	140.2008	0.1443	20.2353	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-372.9438	0.1335	-49.7823	
PV Unit electricity exported	-319.6591	0.1253	-40.0621	
Total			-89.8444	(269)
Total CO2, kg/year			855.6069	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1882.0269	1.1300	2126.6904	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2466.9577	1.1300	2787.6622	(278)
Space and water heating			4914.3525	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	140.2008	1.5338	215.0446	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-372.9438	1.4933	-556.9072	
PV Unit electricity exported	-319.6591	0.4600	-147.0471	
Total			-703.9543	(283)
Total Primary energy kWh/year			4555.5436	(286)
Target Primary Energy Rate (TPER)			81.2800	(287)

Full SAP Calculation Printout

Plot Reference	P-29	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-29
Plot Address	Flat 9, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	83 B	**DER**	5.02	**TER**	15.27
Environmental	97 A	**% DER < TER**			67.13
CO_2 Emissions (t/year)	0.23	**DFEE**	35.01	**TFEE**	39.60
Compliance Check	See BREL	**% DFEE < TFEE**			11.58
% DPER < TPER	36.01	**DPER**	52.01	**TPER**	81.28

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	56.0500	(1b)	x 2.4000	(2b) =	134.5200	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.0500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.5200	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

Effective ac	0.2969	0.2938	0.2906	0.2748	0.2717	0.2559	0.2559	0.2528	0.2622	0.2717	0.2780	0.2843	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			10.3300	1.1450	11.8282			(27)
Terrace Floor			5.8100	0.1400	0.8134	0.0000	0.0000	(28b)
Brickwork	25.6000	10.3300	15.2700	0.2100	3.2067	110.0000	1679.7000	(29a)
Communal Wall	6.9900	2.0600	4.9300	0.2200	1.0846	110.0000	542.3000	(29a)
Lift Shaft Wall	7.9300		7.9300	0.1600	1.2688	110.0000	872.3000	(29a)
Stairwell Wall	10.6600		10.6600	0.1600	1.7056	110.0000	1172.6000	(29a)
Cold Roof	56.0500		56.0500	0.0900	5.0445	9.0000	504.4500	(30)
Total net area of external elements Aum(A, m2)			113.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.4238			(33)
Main dwelling								
Party Wall 1			37.6600	0.0000	0.0000	110.0000	4142.6000	(32)
Party Floor 1			50.2400			70.0000	3516.8000	(32d)
Internal Wall 1			96.7400			9.0000	870.6600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13301.4099 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 237.3133 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	8.4500	0.0380	0.3211
E18 Party wall between dwellings	8.1000	0.0380	0.3078
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0800	0.3300	1.3464
P4 Party wall - Roof (insulation at ceiling level)	13.6900	0.1010	1.3827
E10 Eaves (insulation at ceiling level)	2.4000	0.1200	0.2880
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	6.8200	0.1200	0.8184
E12 Gable (insulation at ceiling level)	7.3500	0.0770	0.5659
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0970	-0.2619
E25 Staggered party wall between dwellings	2.5000	0.0310	0.0775
E15 Flat roof with parapet	8.8100	0.3000	2.6430
E16 Corner (normal)	8.5500	0.0540	0.4617

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.9358 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.1815	13.0414	12.9013	12.2009	12.0608	11.3604	11.3604	11.2203	11.6406	12.0608	12.3410	12.6212	(38)
Heat transfer coeff	49.1173	48.9772	48.8372	48.1367	47.9967	47.2962	47.2962	47.1562	47.5764	47.9967	48.2768	48.5570	(39)

Average = Sum(39)m / 12 = 48.1017

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8763	0.8738	0.8713	0.8588	0.8563	0.8438	0.8438	0.8413	0.8488	0.8563	0.8613	0.8663	(40)
HLP (average)												0.8582	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8681 (42)
Hot water usage for mixer showers

55.5406	54.7060	53.4897	51.1626	49.4452	47.5300	46.4414	47.6485	48.9717	51.0280	53.4051	55.3278	(42a)

Hot water usage for baths

24.0075	23.6510	23.1489	22.2231	21.5299	20.7613	20.3461	20.8447	21.3875	22.2100	23.1548	23.9264	(42b)

Hot water usage for other uses

33.7607	32.5331	31.3054	30.0777	28.8501	27.6224	27.6224	28.8501	30.0777	31.3054	32.5331	33.7607	(42c)

Average daily hot water use (litres/day) 104.1569 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.3089	110.8900	107.9440	103.4634	99.8252	95.9137	94.4099	97.3432	100.4369	104.5434	109.0930	113.0149	(44)
Energy conte	179.4535	157.9059	165.9058	141.6362	134.3839	117.9371	114.1806	120.5312	123.8488	141.8644	155.4230	176.9540	(45)
Energy content (annual)										Total = Sum(45)m =		1730.0244	
Distribution loss (46)m = 0.15 x (45)m	26.9180	23.6859	24.8859	21.2454	20.1576	17.6906	17.1271	18.0797	18.5773	21.2797	23.3134	26.5431	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)
										Total per year (kWh/year) = Sum(64)m =		2074.9494	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.6683	52.5037	55.1637	47.0940	44.6826	39.2141	37.9651	40.0766	41.1797	47.1699	51.6781	58.8372	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.4074	18.1257	14.7408	11.1597	8.3420	7.0427	7.6099	9.8916	13.2765	16.8576	19.6753	20.9746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	243.1151	245.6379	239.2806	225.7466	208.6624	192.6057	181.8788	179.3560	185.7133	199.2473	216.3315	232.3882	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	(71)
Water heating gains (Table 5)	80.1993	78.1305	74.1447	65.4084	60.0573	54.4640	51.0283	53.8665	57.1940	63.4004	71.7752	79.0823	(72)
Total internal gains	429.1593	427.3315	413.6035	387.7522	362.4992	339.5498	325.9544	328.5515	341.6213	364.9427	393.2194	417.8825	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					10.3300	19.6403		0.3300		0.0000	0.7700	51.5528	(76)
Solar gains	51.5528	100.8482	166.0827	242.2217	296.8517	303.8806	289.3067	248.5102	193.1610	119.6649	64.2803	42.3945	(83)
Total gains	480.7121	528.1797	579.6862	629.9738	659.3509	643.4304	615.2611	577.0617	534.7823	484.6076	457.4997	460.2770	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2247	75.4399	75.6562	76.7571	76.9811	78.1211	78.1211	78.3532	77.6611	76.9811	76.5344	76.0928	
alpha	6.0150	6.0293	6.0437	6.1171	6.1321	6.2081	6.2081	6.2235	6.1774	6.1321	6.1023	6.0729	
util living area	0.9830	0.9687	0.9284	0.8237	0.6557	0.4681	0.3380	0.3754	0.6019	0.8722	0.9671	0.9863	(86)
MIT	20.2692	20.4178	20.6425	20.8659	20.9703	20.9968	20.9997	20.9993	20.9864	20.8386	20.5181	20.2381	(87)
Th 2	20.1877	20.1898	20.1920	20.2026	20.2048	20.2155	20.2155	20.2177	20.2112	20.2048	20.2005	20.1962	(88)
util rest of house	0.9784	0.9607	0.9115	0.7895	0.6062	0.4118	0.2779	0.3118	0.5379	0.8374	0.9574	0.9826	(89)
MIT 2	19.3517	19.5384	19.8132	20.0762	20.1818	20.2138	20.2154	20.2174	20.2028	20.0554	19.6745	19.3195	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	19.7442	19.9146	20.1680	20.4141	20.5192	20.5488	20.5509	20.5520	20.5381	20.3905	20.0355	19.7125	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7442	19.9146	20.1680	20.4141	20.5192	20.5488	20.5509	20.5520	20.5381	20.3905	20.0355	19.7125	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9575	0.9109	0.7990	0.6261	0.4358	0.3036	0.3390	0.5648	0.8462	0.9550	0.9798	(94)
Useful gains	468.9053	505.7563	528.0563	503.3570	412.8414	280.4214	186.7842	195.6353	302.0364	410.0780	436.9212	451.0009	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	758.5786	735.3754	667.5066	554.2503	423.2902	281.3556	186.8640	195.7903	306.2996	469.9101	624.4831	753.2403	(97)
Space heating kWh	215.5169	154.3040	103.7510	36.6432	7.7739	0.0000	0.0000	0.0000	0.0000	44.5150	135.0446	224.8661	(98a)
Space heating requirement - total per year (kWh/year)												922.4147	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	215.5169	154.3040	103.7510	36.6432	7.7739	0.0000	0.0000	0.0000	0.0000	44.5150	135.0446	224.8661	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												922.4147	
Space heating per m2											(98c) / (4) =	16.4570	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	215.5169	154.3040	103.7510	36.6432	7.7739	0.0000	0.0000	0.0000	0.0000	44.5150	135.0446	224.8661	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	215.5169	154.3040	103.7510	36.6432	7.7739	0.0000	0.0000	0.0000	0.0000	44.5150	135.0446	224.8661	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	57.7188	50.9770	53.9728	47.0010	45.2570	40.4482	39.6709	41.4268	42.0828	47.3254	50.8130	57.0276	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1889	7.3964	8.1889	7.9247	8.1889	7.9247	8.1889	8.1889	7.9247	8.1889	7.9247	8.1889	(231)
Lighting	17.8625	14.3300	12.9025	9.4530	7.3017	5.9656	6.6609	8.6581	11.2460	14.7553	16.6661	18.3590	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												922.4147	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	573.7214	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	96.4172	(230a)
Total electricity for the above, kWh/year	96.4172	(231)
Electricity for lighting (calculated in Appendix L)	144.1607	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1736.7140	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	922.4147	16.4900	152.1062	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	573.7214	16.4900	94.6067	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	96.4172	16.4900	15.8992	(249)
Energy for lighting	144.1607	16.4900	23.7721	(250)
Additional standing charges			0.0000	(251)
Total energy cost			286.3841	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0203	(257)
SAP value		83.4614	
SAP rating (Section 12)		83	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	922.4147	0.1573	145.0569	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	573.7214	0.1411	80.9531	(264)
Space and water heating			226.0100	(265)
Pumps, fans and electric keep-hot	96.4172	0.1387	13.3743	(267)
Energy for lighting	144.1607	0.1443	20.8068	(268)
Total CO2, kg/year			260.1911	(272)
CO2 emissions per m2			4.6400	(273)
EI value			96.5497	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	56.0500 (1b)	x 2.4000 (2b)	= 134.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 56.0500				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	134.5200	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9700	(17)
Infiltration rate		0.1485	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1357	0.1294	0.1294	0.1199	0.1231	0.1073	0.1073	0.1041	0.1073	0.1199	0.1168	0.1262	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2717	0.2654	0.2654	0.2559	0.2591	0.2433	0.2433	0.2401	0.2433	0.2559	0.2528	0.2622	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			10.3300	1.1450	11.8282			(27)
Terrace Floor			5.8100	0.1400	0.8134	0.0000	0.0000	(28b)
Brickwork	25.6000	10.3300	15.2700	0.2100	3.2067	110.0000	1679.7000	(29a)
Communal Wall	6.9900	2.0600	4.9300	0.2200	1.0846	110.0000	542.3000	(29a)
Lift Shaft Wall	7.9300		7.9300	0.1600	1.2688	110.0000	872.3000	(29a)
Stairwell Wall	10.6600		10.6600	0.1600	1.7056	110.0000	1172.6000	(29a)
Cold Roof	56.0500		56.0500	0.0900	5.0445	9.0000	504.4500	(30)
Total net area of external elements Aum(A, m2)			113.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.4238			(33)
Main dwelling								
Party Wall 1			37.6600	0.0000	0.0000	110.0000	4142.6000	(32)
Party Floor 1			50.2400			70.0000	3516.8000	(32d)
Internal Wall 1			96.7400			9.0000	870.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13301.4099 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		237.3133 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	8.4500	0.0380	0.3211
E18 Party wall between dwellings	8.1000	0.0380	0.3078
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0800	0.3300	1.3464
P4 Party wall - Roof (insulation at ceiling level)	13.6900	0.1010	1.3827
E10 Eaves (insulation at ceiling level)	2.4000	0.1200	0.2880
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	6.8200	0.1200	0.8184
E12 Gable (insulation at ceiling level)	7.3500	0.0770	0.5659
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0970	-0.2619
E25 Staggered party wall between dwellings	2.5000	0.0310	0.0775
E15 Flat roof with parapet	8.8100	0.3000	2.6430
E16 Corner (normal)	8.5500	0.0540	0.4617

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.5120 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	35.9358 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.0608	11.7807	11.7807	11.3604	11.5005	10.8001	10.8001	10.6600	10.8001	11.3604	11.2203	11.6406	(38)
Heat transfer coeff	47.9967	47.7165	47.7165	47.2962	47.4363	46.7359	46.7359	46.5958	46.7359	47.2962	47.1562	47.5764	(39)
Average = Sum(39)m / 12 =												47.2496	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8563	0.8513	0.8513	0.8438	0.8463	0.8338	0.8338	0.8313	0.8338	0.8438	0.8413	0.8488	(40)
HLP (average)												0.8430	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8681	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
55.5406	54.7060	53.4897	51.1626	49.4452	47.5300	46.4414	47.6485	48.9717	51.0280	53.4051	55.3278	(42a)

Hot water usage for baths

24.0075	23.6510	23.1489	22.2231	21.5299	20.7613	20.3461	20.8447	21.3875	22.2100	23.1548	23.9264	(42b)

Hot water usage for other uses

33.7607	32.5331	31.3054	30.0777	28.8501	27.6224	27.6224	28.8501	30.0777	31.3054	32.5331	33.7607	(42c)

Average daily hot water use (litres/day)	104.1569	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.3089	110.8900	107.9440	103.4634	99.8252	95.9137	94.4099	97.3432	100.4369	104.5434	109.0930	113.0149	(44)
Energy conte	179.4535	157.9059	165.9058	141.6362	134.3839	117.9371	114.1806	120.5312	123.8488	141.8644	155.4230	176.9540	(45)
Energy content (annual)										Total = Sum(45)m =		1730.0244	
Distribution loss (46)m = 0.15 x (45)m	26.9180	23.6859	24.8859	21.2454	20.1576	17.6906	17.1271	18.0797	18.5773	21.2797	23.3134	26.5431	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)

Total per year (kWh/year) = Sum(64)m = 2074.9494 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

59.6683	52.5037	55.1637	47.0940	44.6826	39.2141	37.9651	40.0766	41.1797	47.1699	51.6781	58.8372	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

20.4074	18.1257	14.7408	11.1597	8.3420	7.0427	7.6099	9.8916	13.2765	16.8576	19.6753	20.9746	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

243.1151	245.6379	239.2806	225.7466	208.6624	192.6057	181.8788	179.3560	185.7133	199.2473	216.3315	232.3882	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	(71)

Water heating gains (Table 5)

80.1993	78.1305	74.1447	65.4084	60.0573	54.4640	51.0283	53.8665	57.1940	63.4004	71.7752	79.0823	(72)

Total internal gains

429.1593	427.3315	413.6035	387.7522	362.4992	339.5498	325.9544	328.5515	341.6213	364.9427	393.2194	417.8825	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	23.8018	0.3300	0.0000	0.7700	62.4761	(76)

Solar gains	62.4761	106.7506	174.2138	257.2796	306.6405	331.8242	312.8785	275.9294	215.7683	135.8812	76.7371	51.6733	(83)
Total gains	491.6354	534.0821	587.8173	645.0318	669.1396	671.3740	638.8329	604.4809	557.3896	500.8239	469.9564	469.5558	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9811	77.4331	77.4331	78.1211	77.8904	79.0578	79.0578	79.2954	79.0578	78.1211	78.3532	77.6611	
alpha	6.1321	6.1622	6.1622	6.2081	6.1927	6.2705	6.2705	6.2864	6.2705	6.2081	6.2235	6.1774	
util living area	0.9749	0.9562	0.8991	0.7594	0.5662	0.3616	0.2414	0.2620	0.4997	0.8105	0.9477	0.9794	(86)
MIT	20.4011	20.5367	20.7457	20.9256	20.9886	20.9994	21.0000	20.9999	20.9960	20.9082	20.6452	20.3732	(87)
Th 2	20.2048	20.2091	20.2091	20.2155	20.2134	20.2241	20.2241	20.2263	20.2241	20.2155	20.2177	20.2112	(88)
util rest of house	0.9683	0.9453	0.8766	0.7188	0.5141	0.3078	0.1847	0.2024	0.4366	0.7654	0.9327	0.9738	(89)
MIT 2	19.5308	19.7010	19.9491	20.1497	20.2055	20.2239	20.2241	20.2263	20.2220	20.1372	19.8434	19.5016	(90)
Living area fraction									fLA = Living area / (4) =			0.4278	(91)
MIT	19.9031	20.0585	20.2899	20.4817	20.5406	20.5557	20.5560	20.5573	20.5531	20.4670	20.1864	19.8745	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9031	20.0585	20.2899	20.4817	20.5406	20.5557	20.5560	20.5573	20.5531	20.4670	20.1864	19.8745	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9653	0.9429	0.8791	0.7330	0.5360	0.3308	0.2089	0.2279	0.4635	0.7807	0.9320	0.9709	(94)
Useful gains	474.5658	503.5843	516.7437	472.8206	358.6674	222.1161	133.4741	137.7864	258.3774	390.9685	437.9930	455.9066	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)

Heat loss rate W

710.4998	685.1384	615.0600	500.4725	362.4410	222.2612	133.4799	137.7962	259.5311	424.1063	574.6639	702.9193	(97)

Space heating kWh

175.5349	122.0043	73.1473	19.9094	2.8076	0.0000	0.0000	0.0000	0.0000	24.6546	98.4031	183.7774	(98a)

Space heating requirement - total per year (kWh/year) 700.2385

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

175.5349	122.0043	73.1473	19.9094	2.8076	0.0000	0.0000	0.0000	0.0000	24.6546	98.4031	183.7774	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 700.2385

Space heating per m2 (98c) / (4) = 12.4931 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	175.5349	122.0043	73.1473	19.9094	2.8076	0.0000	0.0000	0.0000	0.0000	24.6546	98.4031	183.7774	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	175.5349	122.0043	73.1473	19.9094	2.8076	0.0000	0.0000	0.0000	0.0000	24.6546	98.4031	183.7774	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	57.7188	50.9770	53.9728	47.0010	45.2570	40.4482	39.6709	41.4268	42.0828	47.3254	50.8130	57.0276	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1889	7.3964	8.1889	7.9247	8.1889	7.9247	8.1889	8.1889	7.9247	8.1889	7.9247	8.1889	(231)
Lighting	17.8625	14.3300	12.9025	9.4530	7.3017	5.9656	6.6609	8.6581	11.2460	14.7553	16.6661	18.3590	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 700.2385 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 361.6650
Water heating fuel used 573.7214 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)
mechanical ventilation fans (SFP = 0.5875) 96.4172 (230a)
Total electricity for the above, kWh/year 96.4172 (231)
Electricity for lighting (calculated in Appendix L) 144.1607 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1514.5378 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	700.2385	27.6700	193.7560	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	573.7214	27.6700	158.7487	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	96.4172	27.6700	26.6786	(249)
Energy for lighting	144.1607	27.6700	39.8893	(250)
Additional standing charges			0.0000	(251)
Total energy cost			419.0726	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	700.2385	0.1581	110.7097	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	573.7214	0.1411	80.9531	(264)
Space and water heating			191.6627	(265)
Pumps, fans and electric keep-hot	96.4172	0.1387	13.3743	(267)
Energy for lighting	144.1607	0.1443	20.8068	(268)
Total CO2, kg/year			225.8438	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	700.2385	1.5853	1110.0624	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)

Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	573.7214	1.5218	873.0622 (278)
Space and water heating			1983.1247 (279)
Pumps, fans and electric keep-hot	96.4172	1.5128	145.8600 (281)
Energy for lighting	144.1607	1.5338	221.1185 (282)
Total Primary energy kWh/year			2350.1031 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 83
Current environmental impact rating: A 97

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 83
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£419	£419	£0
Space heating	£220	£220	£0
Water heating	£159	£159	£0
Lighting	£40	£40	£0
Total cost of fuels	£419	£419	£0
Total cost of uses	£419	£419	£0
Delivered energy	27 kWh/m²	27 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	42 kWh/m²	42 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	56.0500	(1b)	x 2.4000	(2b) =	134.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.0500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	134.5200	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9700	(17)
Infiltration rate		0.1485	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2969	0.2938	0.2906	0.2748	0.2717	0.2559	0.2559	0.2528	0.2622	0.2717	0.2780	0.2843	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			10.3300	1.1450	11.8282			(27)
Terrace Floor			5.8100	0.1400	0.8134	0.0000	0.0000	(28b)
Brickwork	25.6000	10.3300	15.2700	0.2100	3.2067	110.0000	1679.7000	(29a)
Communal Wall	6.9900	2.0600	4.9300	0.2200	1.0846	110.0000	542.3000	(29a)
Lift Shaft Wall	7.9300		7.9300	0.1600	1.2688	110.0000	872.3000	(29a)
Stairwell Wall	10.6600		10.6600	0.1600	1.7056	110.0000	1172.6000	(29a)
Cold Roof	56.0500		56.0500	0.0900	5.0445	9.0000	504.4500	(30)
Total net area of external elements Aum(A, m2)			113.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.4238			(33)
Main dwelling								
Party Wall 1			37.6600	0.0000	0.0000	110.0000	4142.6000	(32)
Party Floor 1			50.2400			70.0000	3516.8000	(32d)
Internal Wall 1			96.7400			9.0000	870.6600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13301.4099 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 237.3133 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.4500	0.0380	0.3211
E18 Party wall between dwellings	8.1000	0.0380	0.3078
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0800	0.3300	1.3464
P4 Party wall - Roof (insulation at ceiling level)	13.6900	0.1010	1.3827
E10 Eaves (insulation at ceiling level)	2.4000	0.1200	0.2880
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	6.8200	0.1200	0.8184
E12 Gable (insulation at ceiling level)	7.3500	0.0770	0.5659
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0970	-0.2619
E25 Staggered party wall between dwellings	2.5000	0.0310	0.0775
E15 Flat roof with parapet	8.8100	0.3000	2.6430
E16 Corner (normal)	8.5500	0.0540	0.4617

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5120 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 35.9358 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.1815	13.0414	12.9013	12.2009	12.0608	11.3604	11.3604	11.2203	11.6406	12.0608	12.3410	12.6212	(38)

Heat transfer coeff

	49.1173	48.9772	48.8372	48.1367	47.9967	47.2962	47.2962	47.1562	47.5764	47.9967	48.2768	48.5570	(39)

Average = Sum(39)m / 12 = 48.1017

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8763	0.8738	0.8713	0.8588	0.8563	0.8438	0.8438	0.8413	0.8488	0.8563	0.8613	0.8663	(40)
HLP (average)												0.8582	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8681 (42)

Hot water usage for mixer showers

	55.5406	54.7060	53.4897	51.1626	49.4452	47.5300	46.4414	47.6485	48.9717	51.0280	53.4051	55.3278	(42a)

Hot water usage for baths

	24.0075	23.6510	23.1489	22.2231	21.5299	20.7613	20.3461	20.8447	21.3875	22.2100	23.1548	23.9264	(42b)

Hot water usage for other uses

	33.7607	32.5331	31.3054	30.0777	28.8501	27.6224	27.6224	28.8501	30.0777	31.3054	32.5331	33.7607	(42c)

Average daily hot water use (litres/day) 104.1569 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.3089	110.8900	107.9440	103.4634	99.8252	95.9137	94.4099	97.3432	100.4369	104.5434	109.0930	113.0149	(44)
Energy conte	179.4535	157.9059	165.9058	141.6362	134.3839	117.9371	114.1806	120.5312	123.8488	141.8644	155.4230	176.9540	(45)

Energy content (annual) Total = Sum(45)m = 1730.0244

Distribution loss (46)m = 0.15 x (45)m

	26.9180	23.6859	24.8859	21.2454	20.1576	17.6906	17.1271	18.0797	18.5773	21.2797	23.3134	26.5431	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)

Total per year (kWh/year) = Sum(64)m = 2074.9494 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	59.6683	52.5037	55.1637	47.0940	44.6826	39.2141	37.9651	40.0766	41.1797	47.1699	51.6781	58.8372 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	20.4074	18.1257	14.7408	11.1597	8.3420	7.0427	7.6099	9.8916	13.2765	16.8576	19.6753	20.9746	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	243.1151	245.6379	239.2806	225.7466	208.6624	192.6057	181.8788	179.3560	185.7133	199.2473	216.3315	232.3882	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	(71)

Water heating gains (Table 5)

	80.1993	78.1305	74.1447	65.4084	60.0573	54.4640	51.0283	53.8665	57.1940	63.4004	71.7752	79.0823	(72)

Total internal gains

	429.1593	427.3315	413.6035	387.7522	362.4992	339.5498	325.9544	328.5515	341.6213	364.9427	393.2194	417.8825	(73)

6. Solar gains

[Jan]

	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	19.6403	0.3300	0.0000	0.7700	51.5528	(76)

Solar gains	51.5528	100.8482	166.0827	242.2217	296.8517	303.8806	289.3067	248.5102	193.1610	119.6649	64.2803	42.3945	(83)
Total gains	480.7121	528.1797	579.6862	629.9738	659.3509	643.4304	615.2611	577.0617	534.7823	484.6076	457.4997	460.2770	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2247	75.4399	75.6562	76.7571	76.9811	78.1211	78.1211	78.3532	77.6611	76.9811	76.5344	76.0928	
alpha	6.0150	6.0293	6.0437	6.1171	6.1321	6.2081	6.2081	6.2235	6.1774	6.1321	6.1023	6.0729	
util living area	0.9830	0.9687	0.9284	0.8237	0.6557	0.4681	0.3380	0.3754	0.6019	0.8722	0.9671	0.9863	(86)
MIT	20.2692	20.4178	20.6425	20.8659	20.9703	20.9968	20.9997	20.9993	20.9864	20.8386	20.5181	20.2381	(87)
Th 2	20.1877	20.1898	20.1920	20.2026	20.2048	20.2155	20.2155	20.2177	20.2112	20.2048	20.2005	20.1962	(88)
util rest of house	0.9784	0.9607	0.9115	0.7895	0.6062	0.4118	0.2779	0.3118	0.5379	0.8374	0.9574	0.9826	(89)
MIT 2	19.3517	19.5384	19.8132	20.0762	20.1818	20.2138	20.2154	20.2174	20.2028	20.0554	19.6745	19.3195	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	19.7442	19.9146	20.1680	20.4141	20.5192	20.5488	20.5509	20.5520	20.5381	20.3905	20.0355	19.7125	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7442	19.9146	20.1680	20.4141	20.5192	20.5488	20.5509	20.5520	20.5381	20.3905	20.0355	19.7125	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9575	0.9109	0.7990	0.6261	0.4358	0.3036	0.3390	0.5648	0.8462	0.9550	0.9798	(94)
Useful gains	468.9053	505.7563	528.0563	503.3570	412.8414	280.4214	186.7842	195.6353	302.0364	410.0780	436.9212	451.0009	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	758.5786	735.3754	667.5066	554.2503	423.2902	281.3556	186.8640	195.7903	306.2996	469.9101	624.4831	753.2403	(97)
Space heating kWh	215.5169	154.3040	103.7510	36.6432	7.7739	0.0000	0.0000	0.0000	0.0000	44.5150	135.0446	224.8661	(98a)
Space heating requirement - total per year (kWh/year)												922.4147	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	215.5169	154.3040	103.7510	36.6432	7.7739	0.0000	0.0000	0.0000	0.0000	44.5150	135.0446	224.8661	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												922.4147	
Space heating per m2											(98c) / (4) =	16.4570	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	215.5169	154.3040	103.7510	36.6432	7.7739	0.0000	0.0000	0.0000	0.0000	44.5150	135.0446	224.8661	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	215.5169	154.3040	103.7510	36.6432	7.7739	0.0000	0.0000	0.0000	0.0000	44.5150	135.0446	224.8661	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	57.7188	50.9770	53.9728	47.0010	45.2570	40.4482	39.6709	41.4268	42.0828	47.3254	50.8130	57.0276	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1889	7.3964	8.1889	7.9247	8.1889	7.9247	8.1889	8.1889	7.9247	8.1889	7.9247	8.1889	(231)
Lighting	17.8625	14.3300	12.9025	9.4530	7.3017	5.9656	6.6609	8.6581	11.2460	14.7553	16.6661	18.3590	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												922.4147	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												573.7214	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												96.4172	(230a)
Total electricity for the above, kWh/year												96.4172	(231)
Electricity for lighting (calculated in Appendix L)												144.1607	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1736.7140	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	922.4147	16.4900	152.1062	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	573.7214	16.4900	94.6067	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	96.4172	16.4900	15.8992	(249)
Energy for lighting	144.1607	16.4900	23.7721	(250)
Additional standing charges			0.0000	(251)
Total energy cost			286.3841	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0203	(257)
SAP value		83.4614	
SAP rating (Section 12)		83	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	922.4147	0.1573	145.0569	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	573.7214	0.1411	80.9531	(264)
Space and water heating			226.0100	(265)
Pumps, fans and electric keep-hot	96.4172	0.1387	13.3743	(267)
Energy for lighting	144.1607	0.1443	20.8068	(268)
Total CO2, kg/year			260.1911	(272)
CO2 emissions per m2			4.6400	(273)
EI value			96.5497	
EI rating			97	(274)
EI band			A	

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	56.0500	(1b)	x 2.4000	(2b) =	134.5200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.0500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		134.5200	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1357	0.1294	0.1294	0.1199	0.1231	0.1073	0.1073	0.1041	0.1073	0.1199	0.1168	0.1262	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2717	0.2654	0.2654	0.2559	0.2591	0.2433	0.2433	0.2401	0.2433	0.2559	0.2528	0.2622	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window-Red			10.3300	1.1450	11.8282			(27)
Terrace Floor			5.8100	0.1400	0.8134	0.0000	0.0000	(28b)
Brickwork	25.6000	10.3300	15.2700	0.2100	3.2067	110.0000	1679.7000	(29a)
Communal Wall	6.9900	2.0600	4.9300	0.2200	1.0846	110.0000	542.3000	(29a)
Lift Shaft Wall	7.9300		7.9300	0.1600	1.2688	110.0000	872.3000	(29a)
Stairwell Wall	10.6600		10.6600	0.1600	1.7056	110.0000	1172.6000	(29a)
Cold Roof	56.0500		56.0500	0.0900	5.0445	9.0000	504.4500	(30)
Total net area of external elements Aum(A, m2)			113.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.4238			(33)
Main dwelling								
Party Wall 1			37.6600	0.0000	0.0000	110.0000	4142.6000	(32)
Party Floor 1			50.2400			70.0000	3516.8000	(32d)
Internal Wall 1			96.7400			9.0000	870.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 13301.4099 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	237.3133 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	8.4500	0.0380	0.3211
E18 Party wall between dwellings	8.1000	0.0380	0.3078
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.6900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0800	0.3300	1.3464
P4 Party wall - Roof (insulation at ceiling level)	13.6900	0.1010	1.3827
E10 Eaves (insulation at ceiling level)	2.4000	0.1200	0.2880
E2 Other lintels (including other steel lintels)	5.3100	0.0500	0.2655
E4 Jamb	18.4900	0.0160	0.2958
E20 Exposed floor (normal)	6.8200	0.1200	0.8184
E12 Gable (insulation at ceiling level)	7.3500	0.0770	0.5659
E17 Corner (inverted - internal area greater than external area)	2.7000	-0.0970	-0.2619
E25 Staggered party wall between dwellings	2.5000	0.0310	0.0775
E15 Flat roof with parapet	8.8100	0.3000	2.6430
E16 Corner (normal)	8.5500	0.0540	0.4617

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.5120 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 35.9358 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.0608	11.7807	11.7807	11.3604	11.5005	10.8001	10.8001	10.6600	10.8001	11.3604	11.2203	11.6406	(38)
Heat transfer coeff	47.9967	47.7165	47.7165	47.2962	47.4363	46.7359	46.7359	46.5958	46.7359	47.2962	47.1562	47.5764	(39)
Average = Sum(39)m / 12 =												47.2496	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8563	0.8513	0.8513	0.8438	0.8463	0.8338	0.8338	0.8313	0.8338	0.8438	0.8413	0.8488	(40)
HLP (average)												0.8430	

Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8681	(42)
Hot water usage for mixer showers													
	55.5406	54.7060	53.4897	51.1626	49.4452	47.5300	46.4414	47.6485	48.9717	51.0280	53.4051	55.3278	(42a)
Hot water usage for baths													
	24.0075	23.6510	23.1489	22.2231	21.5299	20.7613	20.3461	20.8447	21.3875	22.2100	23.1548	23.9264	(42b)
Hot water usage for other uses													
	33.7607	32.5331	31.3054	30.0777	28.8501	27.6224	27.6224	28.8501	30.0777	31.3054	32.5331	33.7607	(42c)
Average daily hot water use (litres/day)												104.1569	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	113.3089	110.8900	107.9440	103.4634	99.8252	95.9137	94.4099	97.3432	100.4369	104.5434	109.0930	113.0149	(44)
Energy conte	179.4535	157.9059	165.9058	141.6362	134.3839	117.9371	114.1806	120.5312	123.8488	141.8644	155.4230	176.9540	(45)
Energy content (annual)										Total = Sum(45)m =		1730.0244	
Distribution loss (46)m = 0.15 x (45)m													
	26.9180	23.6859	24.8859	21.2454	20.1576	17.6906	17.1271	18.0797	18.5773	21.2797	23.3134	26.5431	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)
										Total per year (kWh/year) = Sum(64)m =		2074.9494	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	59.6683	52.5037	55.1637	47.0940	44.6826	39.2141	37.9651	40.0766	41.1797	47.1699	51.6781	58.8372	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	112.0831	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.4074	18.1257	14.7408	11.1597	8.3420	7.0427	7.6099	9.8916	13.2765	16.8576	19.6753	20.9746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	243.1151	245.6379	239.2806	225.7466	208.6624	192.6057	181.8788	179.3560	185.7133	199.2473	216.3315	232.3882	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	48.0764	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	-74.7221	(71)
Water heating gains (Table 5)													
	80.1993	78.1305	74.1447	65.4084	60.0573	54.4640	51.0283	53.8665	57.1940	63.4004	71.7752	79.0823	(72)
Total internal gains													
	429.1593	427.3315	413.6035	387.7522	362.4992	339.5498	325.9544	328.5515	341.6213	364.9427	393.2194	417.8825	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.3300	23.8018	0.3300	0.0000	0.7700	62.4761	(76)

Solar gains	62.4761	106.7506	174.2138	257.2796	306.6405	331.8242	312.8785	275.9294	215.7683	135.8812	76.7371	51.6733	(83)
Total gains	491.6354	534.0821	587.8173	645.0318	669.1396	671.3740	638.8329	604.4809	557.3896	500.8239	469.9564	469.5558	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9811	77.4331	77.4331	78.1211	77.8904	79.0578	79.0578	79.2954	79.0578	78.1211	78.3532	77.6611	
alpha	6.1321	6.1622	6.1622	6.2081	6.1927	6.2705	6.2705	6.2864	6.2705	6.2081	6.2235	6.1774	
util living area													
	0.9749	0.9562	0.8991	0.7594	0.5662	0.3616	0.2414	0.2620	0.4997	0.8105	0.9477	0.9794	(86)
MIT	20.4011	20.5367	20.7457	20.9256	20.9886	20.9994	21.0000	20.9999	20.9960	20.9082	20.6452	20.3732	(87)
Th 2	20.2048	20.2091	20.2091	20.2155	20.2134	20.2241	20.2241	20.2263	20.2241	20.2155	20.2177	20.2112	(88)
util rest of house													
	0.9683	0.9453	0.8766	0.7188	0.5141	0.3078	0.1847	0.2024	0.4366	0.7654	0.9327	0.9738	(89)
MIT 2	19.5308	19.7010	19.9491	20.1497	20.2055	20.2239	20.2241	20.2263	20.2220	20.1372	19.8434	19.5016	(90)
Living area fraction									fLA = Living area / (4) =			0.4278	(91)
MIT	19.9031	20.0585	20.2899	20.4817	20.5406	20.5557	20.5560	20.5573	20.5531	20.4670	20.1864	19.8745	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9031	20.0585	20.2899	20.4817	20.5406	20.5557	20.5560	20.5573	20.5531	20.4670	20.1864	19.8745	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9653	0.9429	0.8791	0.7330	0.5360	0.3308	0.2089	0.2279	0.4635	0.7807	0.9320	0.9709	(94)
Useful gains	474.5658	503.5843	516.7437	472.8206	358.6674	222.1161	133.4741	137.7864	258.3774	390.9685	437.9930	455.9066	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	710.4998	685.1384	615.0600	500.4725	362.4410	222.2612	133.4799	137.7962	259.5311	424.1063	574.6639	702.9193	(97)
Space heating kWh	175.5349	122.0043	73.1473	19.9094	2.8076	0.0000	0.0000	0.0000	0.0000	24.6546	98.4031	183.7774	(98a)
Space heating requirement - total per year (kWh/year)												700.2385	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	175.5349	122.0043	73.1473	19.9094	2.8076	0.0000	0.0000	0.0000	0.0000	24.6546	98.4031	183.7774	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												700.2385	
Space heating per m2											(98c) / (4) =	12.4931	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	175.5349	122.0043	73.1473	19.9094	2.8076	0.0000	0.0000	0.0000	0.0000	24.6546	98.4031	183.7774	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	175.5349	122.0043	73.1473	19.9094	2.8076	0.0000	0.0000	0.0000	0.0000	24.6546	98.4031	183.7774	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	208.7485	184.3659	195.2008	169.9862	163.6789	146.2871	143.4756	149.8262	152.1988	171.1594	183.7730	206.2490	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	57.7188	50.9770	53.9728	47.0010	45.2570	40.4482	39.6709	41.4268	42.0828	47.3254	50.8130	57.0276	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.1889	7.3964	8.1889	7.9247	8.1889	7.9247	8.1889	8.1889	7.9247	8.1889	7.9247	8.1889	(231)
Lighting	17.8625	14.3300	12.9025	9.4530	7.3017	5.9656	6.6609	8.6581	11.2460	14.7553	16.6661	18.3590	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	700.2385 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	361.6650
Water heating fuel used	573.7214 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)	
mechanical ventilation fans (SFP = 0.5875)	96.4172 (230a)
Total electricity for the above, kWh/year	96.4172 (231)
Electricity for lighting (calculated in Appendix L)	144.1607 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1514.5378 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	700.2385	27.6700	193.7560	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	573.7214	27.6700	158.7487	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	96.4172	27.6700	26.6786	(249)
Energy for lighting	144.1607	27.6700	39.8893	(250)
Additional standing charges			0.0000	(251)
Total energy cost			419.0726	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	700.2385	0.1581	110.7097	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	573.7214	0.1411	80.9531	(264)
Space and water heating			191.6627	(265)
Pumps, fans and electric keep-hot	96.4172	0.1387	13.3743	(267)
Energy for lighting	144.1607	0.1443	20.8068	(268)
Total CO2, kg/year			225.8438	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	700.2385	1.5853	1110.0624	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	573.7214	1.5218	873.0622	(278)
Space and water heating			1983.1247	(279)
Pumps, fans and electric keep-hot	96.4172	1.5128	145.8600	(281)
Energy for lighting	144.1607	1.5338	221.1185	(282)
Total Primary energy kWh/year			2350.1031	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-30	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-30
Plot Address	Flat 10, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	4.83	**TER**	12.85
Environmental	96 A	**% DER < TER**			62.41
CO_2 Emissions (t/year)	0.31	**DFEE**	35.29	**TFEE**	36.36
Compliance Check	See BREL	**% DFEE < TFEE**			2.93
% DPER < TPER	26.74	**DPER**	49.80	**TPER**	67.97

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	213.79	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	28.07 m	78.78 m²	2.40 m

8.0 Living Area	27.37	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	56.27	37.51	0.00	None	18.76	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.60	4.54	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	14.34	14.34	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	30.93	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	156.90

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Plane Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	78.78	78.78	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Terrace Floor	Exposed Floor - Solid	Lowest occupied	Other	0.14	None	0.00	0.00	5.71

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	73.07

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window-Red	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.31			1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	North	2.06	
Patio Door	Window-Red	Brickwork	East	6.50	
East	Window-Red	Brickwork	East	4.91	
South	Window	Brickwork	South	7.34	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	17.37	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	5.50	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	11.25	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.00	0.33	0.33	Abbey Calculated	No
E16 Corner (normal)	Gov Approved Scheme	8.25	0.05	0.05	RCD	No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	11.25	0.10	0.10	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	18.16	0.06	0.06	RCD	No
E20 Exposed floor (normal)	Independently assessed	6.77	0.12	0.12	-	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	11.55	0.10	0.10		No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.50	-0.10	-0.10	RCD	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	5.50	0.03	0.03	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	9.84	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	29.29	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes

Y-value	0.06	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

Summary for Input Data

elmhurst energy

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.94	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No

Summary for Input Data

Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-30	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-30
Plot Address	Flat 10, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	4.83	**TER**	12.85
Environmental	96 A	**% DER < TER**			62.41
CO_2 Emissions (t/year)	0.31	**DFEE**	35.29	**TFEE**	36.36
Compliance Check	See BREL	**% DFEE < TFEE**			2.93
% DPER < TPER	26.74	**DPER**	49.80	**TPER**	67.97

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.7800	(1b)	x 2.4000	(2b) =	189.0720	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.0720	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9400 (17)
Infiltration rate		0.1470 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1249 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1593	0.1562	0.1531	0.1374	0.1343	0.1187	0.1187	0.1156	0.1249	0.1343	0.1406	0.1468	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2953	0.2922	0.2891	0.2734	0.2703	0.2547	0.2547	0.2516	0.2610	0.2703	0.2766	0.2828	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			7.3400	1.1450	8.4046			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Terrace Floor			5.7100	0.1400	0.7994	0.0000	0.0000	(28b)
Brickwork	56.2700	18.7500	37.5200	0.2100	7.8792	110.0000	4127.2001	(29a)
Communal Wall	6.6000	2.0600	4.5400	0.2200	0.9988	110.0000	499.4000	(29a)
Stairwell Wall	14.3400		14.3400	0.1600	2.2944	110.0000	1577.4000	(29a)
Plane Roof	78.7800		78.7800	0.0900	7.0902	9.0000	709.0200	(30)
Total net area of external elements Aum(A, m2)			161.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.0384			(33)
Main dwelling								
Party Wall 1			30.9300	0.0000	0.0000	110.0000	3402.3000	(32)
Party Floor 1			73.0700			70.0000	5114.9000	(32d)
Internal Wall 1			156.9000			9.0000	1412.0999	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16842.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7893 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	17.3700	0.0380	0.6601
E18	Party wall between dwellings	5.5000	0.0380	0.2090
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	11.2500	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
E16	Corner (normal)	8.2500	0.0540	0.4455
P4	Party wall - Roof (insulation at ceiling level)	11.2500	0.1010	1.1362
E10	Eaves (insulation at ceiling level)	18.1600	0.0630	1.1441
E20	Exposed floor (normal)	6.7700	0.1200	0.8124
E12	Gable (insulation at ceiling level)	11.5500	0.0980	1.1319
E17	Corner (inverted - internal area greater than external area)	5.5000	-0.0970	-0.5335
E25	Staggered party wall between dwellings	5.5000	0.0310	0.1705
E2	Other lintels (including other steel lintels)	9.8400	0.0500	0.4920
E4	Jamb	29.2900	0.0160	0.4686
E5	Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2008 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.2392 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.4256	18.2307	18.0358	17.0613	16.8664	15.8918	15.8918	15.6969	16.2817	16.8664	17.2562	17.6460	(38)
Heat transfer coeff	72.6648	72.4699	72.2750	71.3005	71.1056	70.1311	70.1311	69.9362	70.5209	71.1056	71.4954	71.8852	(39)

Average = Sum(39)m / 12 = 71.2518

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9224	0.9199	0.9174	0.9051	0.9026	0.8902	0.8902	0.8877	0.8952	0.9026	0.9075	0.9125	(40)
HLP (average)												0.9044	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4393 (42)
Hot water usage for mixer showers

65.1188	64.1402	62.7142	59.9857	57.9722	55.7268	54.4504	55.8657	57.4170	59.8280	62.6150	64.8693	(42a)

Hot water usage for baths

28.1265	27.7087	27.1205	26.0359	25.2238	24.3232	23.8368	24.4209	25.0569	26.0205	27.1275	28.0314	(42b)

Hot water usage for other uses

39.6109	38.1705	36.7301	35.2897	33.8493	32.4089	32.4089	33.8493	35.2897	36.7301	38.1705	39.6109	(42c)

Average daily hot water use (litres/day) 122.1250 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.8562	130.0195	126.5648	121.3114	117.0453	112.4589	110.6962	114.1360	117.7637	122.5786	127.9130	132.5116	(44)
Energy conte	210.4117	185.1460	194.5254	166.0692	157.5655	138.2814	133.8775	141.3241	145.2144	166.3381	182.2355	207.4812	(45)
Energy content (annual)										Total = Sum(45)m =		2028.4701	
Distribution loss (46)m = 0.15 x (45)m	31.5618	27.7719	29.1788	24.9104	23.6348	20.7422	20.0816	21.1986	21.7822	24.9507	27.3353	31.1222	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)
										Total per year (kWh/year) = Sum(64)m =		2373.3951	(64)
12Total per year (kWh/year)												2373	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.9619	61.5610	64.6797	55.2180	52.3905	45.9786	44.5143	46.9903	48.2838	55.3074	60.5933	68.9875	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.3869	121.1070	109.3869	113.0332	109.3869	113.0332	109.3869	109.3869	113.0332	109.3869	113.0332	109.3869	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.8719	219.1223	213.4512	201.3782	186.1382	171.8147	162.2458	159.9953	165.6664	177.7394	192.9794	207.3029	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	(71)
Water heating gains (Table 5)	94.0348	91.6087	86.9351	76.6917	70.4174	63.8591	59.8310	63.1590	67.0608	74.3379	84.1574	92.7251	(72)
Total internal gains	479.8832	491.4276	469.3628	450.6927	425.5321	408.2966	391.0533	392.1308	405.3500	421.0538	449.7596	469.0045	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
South	7.3400	46.7521	0.3300	0.0000	0.7700	87.1970	(78)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	140.6886	247.4471	354.2384	456.9285	522.2609	521.4907	501.6391	453.4942	390.4515	278.1951	170.0559	119.3351	(83)
Total gains	620.5718	738.8746	823.6012	907.6212	947.7930	929.7873	892.6924	845.6250	795.8015	699.2489	619.8154	588.3396	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.3836	64.5568	64.7309	65.6156	65.7954	66.7097	66.7097	66.8956	66.3410	65.7954	65.4367	65.0819	
alpha	5.2922	5.3038	5.3154	5.3744	5.3864	5.4473	5.4473	5.4597	5.4227	5.3864	5.3624	5.3388	
util living area	0.9857	0.9656	0.9239	0.8210	0.6640	0.4780	0.3450	0.3792	0.5942	0.8660	0.9685	0.9889	(86)
MIT	20.0298	20.2688	20.5367	20.8097	20.9482	20.9928	20.9990	20.9983	20.9778	20.7832	20.3636	19.9888	(87)
Th 2	20.1485	20.1506	20.1527	20.1632	20.1653	20.1758	20.1758	20.1779	20.1716	20.1653	20.1611	20.1569	(88)
util rest of house	0.9821	0.9575	0.9070	0.7873	0.6138	0.4184	0.2807	0.3121	0.5293	0.8315	0.9597	0.9860	(89)
MIT 2	19.0270	19.3273	19.6563	19.9795	20.1234	20.1716	20.1755	20.1773	20.1571	19.9602	19.4576	18.9815	(90)
Living area fraction									fLA = Living area / (4) =			0.3474	(91)
MIT	19.3754	19.6544	19.9622	20.2679	20.4100	20.4569	20.4616	20.4625	20.4422	20.2461	19.7724	19.3315	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3754	19.6544	19.9622	20.2679	20.4100	20.4569	20.4616	20.4625	20.4422	20.2461	19.7724	19.3315	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9780	0.9518	0.9028	0.7918	0.6289	0.4389	0.3031	0.3354	0.5509	0.8352	0.9547	0.9824	(94)
Useful gains	606.8951	703.2574	743.5127	718.6685	596.1010	408.0598	270.5316	283.6282	438.4294	583.9919	591.7410	577.9743	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1095.4521	1069.2504	972.9788	810.5387	619.3291	410.7507	270.8160	284.1179	447.2571	685.8929	906.0160	1087.7297	(97)
Space heating kWh	363.4865	245.9474	170.7228	66.1465	17.2817	0.0000	0.0000	0.0000	0.0000	75.8143	226.2780	379.2581	(98a)
Space heating requirement - total per year (kWh/year)												1544.9352	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	363.4865	245.9474	170.7228	66.1465	17.2817	0.0000	0.0000	0.0000	0.0000	75.8143	226.2780	379.2581	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1544.9352	
Space heating per m2											(98c) / (4) =	19.6108	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	363.4865	245.9474	170.7228	66.1465	17.2817	0.0000	0.0000	0.0000	0.0000	75.8143	226.2780	379.2581	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	363.4865	245.9474	170.7228	66.1465	17.2817	0.0000	0.0000	0.0000	0.0000	75.8143	226.2780	379.2581	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	66.2787	58.5088	61.8861	53.7567	51.6667	46.0734	45.1170	47.1760	47.9904	54.0923	58.2267	65.4684	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.5097	10.3959	11.5097	11.1384	11.5097	11.1384	11.5097	11.5097	11.1384	11.5097	11.1384	11.5097	(231)
Lighting	22.2639	17.8609	16.0818	11.7822	9.1009	7.4355	8.3022	10.7915	14.0170	18.3911	20.7727	22.8827	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1544.9352	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	656.2413	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	135.5174	(230a)
Total electricity for the above, kWh/year	135.5174	(231)
Electricity for lighting (calculated in Appendix L)	179.6823	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2516.3762	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1544.9352	0.1571	242.7584	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	656.2413	0.1412	92.6361	(264)
Space and water heating			335.3945	(265)
Pumps, fans and electric keep-hot	135.5174	0.1387	18.7979	(267)
Energy for lighting	179.6823	0.1443	25.9337	(268)
Total CO2, kg/year			380.1261	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1544.9352	1.5817	2443.5907	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	656.2413	1.5220	998.7845	(278)
Space and water heating			3442.3752	(279)
Pumps, fans and electric keep-hot	135.5174	1.5128	205.0107	(281)
Energy for lighting	179.6823	1.5338	275.6028	(282)
Total Primary energy kWh/year			3922.9886	(286)
Dwelling Primary energy Rate (DPER)			49.8000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.7800	(1b)	x 2.4000	(2b) =	189.0720	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		189.0720	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1587	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4087	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3474	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4429	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3474	0.3734	0.3908	0.4082 (22b)
Effective ac	0.5981	0.5943	0.5905	0.5730	0.5697	0.5545	0.5545	0.5516	0.5603	0.5697	0.5764	0.5833 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.6500	1.1450	20.2099			(27)
Terrace Floor			5.7100	0.1300	0.7423			(28b)
Brickwork	56.2700	17.6500	38.6200	0.1800	6.9516			(29a)
Communal Wall	6.6000	2.0600	4.5400	0.1800	0.8172			(29a)
Stairwell Wall	14.3400		14.3400	0.1800	2.5812			(29a)
Plane Roof	78.7800		78.7800	0.1100	8.6658			(30)
Total net area of external elements Aum(A, m2)			161.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.0280			(33)
Main dwelling								
Party Wall 1			30.9300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7893 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.3700	0.0700	1.2159
E18 Party wall between dwellings	5.5000	0.0600	0.3300
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.2500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.0200	0.0800
E16 Corner (normal)	8.2500	0.0900	0.7425
P4 Party wall - Roof (insulation at ceiling level)	11.2500	0.1200	1.3500
E10 Eaves (insulation at ceiling level)	18.1600	0.0600	1.0896
E20 Exposed floor (normal)	6.7700	0.3200	2.1664
E12 Gable (insulation at ceiling level)	11.5500	0.0600	0.6930
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0900	-0.4950
E25 Staggered party wall between dwellings	5.5000	0.0600	0.3300
E2 Other lintels (including other steel lintels)	9.8400	0.0500	0.4920
E4 Jamb	29.2900	0.0500	1.4645
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.3789 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 55.4069 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.3164	37.0787	36.8458	35.7518	35.5471	34.5942	34.5942	34.4178	34.9613	35.5471	35.9612	36.3941	(38)
Heat transfer coeff	92.7233	92.4857	92.2527	91.1587	90.9540	90.0012	90.0012	89.8247	90.3682	90.9540	91.3681	91.8010	(39)
Average = Sum(39)m / 12 =												91.1577	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1770	1.1740	1.1710	1.1571	1.1545	1.1424	1.1424	1.1402	1.1471	1.1545	1.1598	1.1653	(40)
HLP (average)												1.1571	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4393 (42)

Hot water usage for mixer showers

65.1188	64.1402	62.7142	59.9857	57.9722	55.7268	54.4504	55.8657	57.4170	59.8280	62.6150	64.8693	(42a)

Hot water usage for baths

28.1265	27.7087	27.1205	26.0359	25.2238	24.3232	23.8368	24.4209	25.0569	26.0205	27.1275	28.0314	(42b)

Hot water usage for other uses

39.6109	38.1705	36.7301	35.2897	33.8493	32.4089	32.4089	33.8493	35.2897	36.7301	38.1705	39.6109	(42c)

Average daily hot water use (litres/day) 122.1250 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.8562	130.0195	126.5648	121.3114	117.0453	112.4589	110.6962	114.1360	117.7637	122.5786	127.9130	132.5116	(44)
Energy conte	210.4117	185.1460	194.5254	166.0692	157.5655	138.2814	133.8775	141.3241	145.2144	166.3381	182.2355	207.4812	(45)
Energy content (annual)											Total = Sum(45)m =	2028.4701	
Distribution loss (46)m = 0.15 x (45)m	31.5618	27.7719	29.1788	24.9104	23.6348	20.7422	20.0816	21.1986	21.7822	24.9507	27.3353	31.1222	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

257.0066	227.2317	241.1203	211.1611	204.1604	183.3732	180.4724	187.9191	190.3063	212.9330	227.3274	254.0761	(62)
WWHRS -29.7696	-26.3285	-27.5697	-22.8288	-21.2756	-18.2057	-17.0649	-18.1468	-18.8363	-22.2059	-25.1566	-29.2183	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	227.2370	200.9032	213.5506	188.3323	182.8848	165.1675	163.4074	169.7722	171.4700	190.7270	202.1708	224.8577	(64)
										Total per year (kWh/year) = Sum(64)m =		2300.4807	(64)
12Total per year (kWh/year)												2300	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

107.2378	95.2296	101.9556	91.2915	89.6665	82.0520	81.7902	84.2662	84.3573	92.5833	96.6668	106.2634	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	109.3777	121.0967	109.3777	113.0236	109.3777	113.0236	109.3777	109.3777	113.0236	109.3777	113.0236	109.3777	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	216.8719	219.1223	213.4512	201.3782	186.1382	171.8147	162.2458	159.9953	165.6664	177.7394	192.9794	207.3029	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	(71)

Water heating gains (Table 5)

	144.1369	141.7107	137.0371	126.7937	120.5194	113.9612	109.9330	113.2610	117.1629	124.4400	134.2594	142.8272	(72)

Total internal gains

	532.9760	544.5193	522.4556	503.7851	478.6249	458.3890	441.1460	442.2236	455.4424	474.1466	502.8520	522.0973	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.7300	19.6403	0.6300	0.7000	0.7700	64.4049	(76)
South	6.9200	46.7521	0.6300	0.7000	0.7700	98.8732	(78)

Solar gains	163.2781	287.9185	413.7556	535.7357	613.7909	613.4289	589.8588	532.2990	456.7879	324.1528	197.5038	138.3990	(83)
Total gains	696.2541	832.4378	936.2112	1039.5209	1092.4157	1071.8180	1031.0049	974.5225	912.2303	798.2994	700.3558	660.4963	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.4557	50.5854	50.7131	51.3217	51.4372	51.9818	51.9818	52.0839	51.7707	51.4372	51.2041	50.9626	
alpha	4.3637	4.3724	4.3809	4.4214	4.4291	4.4655	4.4655	4.4723	4.4514	4.4291	4.4136	4.3975	
util living area													
	0.9829	0.9637	0.9263	0.8389	0.6993	0.5213	0.3808	0.4187	0.6380	0.8777	0.9662	0.9861	(86)
MIT	19.6795	19.9498	20.2802	20.6456	20.8742	20.9735	20.9947	20.9920	20.9362	20.6235	20.0901	19.6352	(87)
Th 2	19.9385	19.9409	19.9433	19.9544	19.9565	19.9663	19.9663	19.9681	19.9626	19.9565	19.9523	19.9479	(88)
util rest of house													
	0.9784	0.9546	0.9083	0.8027	0.6404	0.4435	0.2930	0.3274	0.5579	0.8409	0.9561	0.9824	(89)
MIT 2	18.4308	18.7706	19.1779	19.6132	19.8554	19.9512	19.9645	19.9652	19.9214	19.6025	18.9591	18.3817	(90)
Living area fraction									fLA = Living area / (4) =			0.3474	(91)
MIT	18.8646	19.1803	19.5609	19.9718	20.2094	20.3064	20.3225	20.3219	20.2740	19.9572	19.3521	18.8172	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8646	19.1803	19.5609	19.9718	20.2094	20.3064	20.3225	20.3219	20.2740	19.9572	19.3521	18.8172	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9723	0.9464	0.9006	0.8033	0.6554	0.4697	0.3235	0.3590	0.5830	0.8409	0.9487	0.9770	(94)
Useful gains	676.9749	787.7977	843.1447	835.0642	716.0068	503.3858	333.5278	349.9023	531.8572	671.3141	664.4345	645.3123	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1350.4821	1320.7209	1204.9009	1009.2951	773.9612	513.5811	335.0254	352.2871	557.9314	851.0764	1119.4479	1341.8719	(97)
Space heating kWh													
	501.0893	358.1244	269.1466	125.4462	43.1180	0.0000	0.0000	0.0000	0.0000	133.7431	327.6096	518.2403	(98a)
Space heating requirement - total per year (kWh/year)												2276.5176	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	501.0893	358.1244	269.1466	125.4462	43.1180	0.0000	0.0000	0.0000	0.0000	133.7431	327.6096	518.2403	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2276.5176	
Space heating per m2										(98c) / (4) =		28.8972	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	501.0893	358.1244	269.1466	125.4462	43.1180	0.0000	0.0000	0.0000	0.0000	133.7431	327.6096	518.2403	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	542.8920	388.0004	291.5997	135.9114	46.7151	0.0000	0.0000	0.0000	0.0000	144.9005	354.9400	561.4738	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	227.2370	200.9032	213.5506	188.3323	182.8848	165.1675	163.4074	169.7722	171.4700	190.7270	202.1708	224.8577	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7815	85.3410	84.5798	83.1700	81.3735	79.8000	79.8000	79.8000	79.8000	83.2791	85.1358	85.8695	(217)
Fuel for water heating, kWh/month													

	264.9020	235.4123	252.4842	226.4425	224.7475	206.9769	204.7712	212.7471	214.8746	229.0216	237.4685	261.8598 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.7265	18.2321	16.4159	12.0270	9.2900	7.5900	8.4747	11.0157	14.3083	18.7733	21.2044	23.3582 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-21.0095	-31.0745	-46.8345	-55.2972	-61.9384	-58.6530	-57.9295	-53.5358	-46.1982	-36.6773	-23.6061	-17.9976 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.8279	-16.8050	-34.0408	-52.0806	-69.8082	-70.4937	-69.6722	-58.5638	-42.3621	-24.3511	-10.5521	-6.1658 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2466.4329 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2771.7084 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	183.4160 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-973.4747 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4534.0826 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2466.4329	0.2100	517.9509	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2771.7084	0.2100	582.0588	(264)
Space and water heating			1100.0097	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	183.4160	0.1443	26.4726	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.7515	0.1336	-68.2325	
PV Unit electricity exported	-462.7232	0.1254	-58.0048	
Total			-126.2373	(269)
Total CO2, kg/year			1012.1743	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2466.4329	1.1300	2787.0692	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2771.7084	1.1300	3132.0305	(278)
Space and water heating			5919.0996	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	183.4160	1.5338	281.3296	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.7515	1.4937	-762.8984	
PV Unit electricity exported	-462.7232	0.4601	-212.9054	
Total			-975.8037	(283)
Total Primary energy kWh/year			5354.7263	(286)
Target Primary Energy Rate (TPER)			67.9700	(287)

Full SAP Calculation Printout

Plot Reference	P-30	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-30
Plot Address	Flat 10, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	4.83	**TER**	12.85
Environmental	96 A	**% DER < TER**			62.41
CO_2 Emissions (t/year)	0.31	**DFEE**	35.29	**TFEE**	36.36
Compliance Check	See BREL	**% DFEE < TFEE**			2.93
% DPER < TPER	26.74	**DPER**	49.80	**TPER**	67.97

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.7800	(1b)	x 2.4000	(2b) =	189.0720	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.0720	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1587 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.9400 (17)
Infiltration rate			0.3057 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2598 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3313	0.3248	0.3183	0.2858	0.2793	0.2468	0.2468	0.2403	0.2598	0.2793	0.2923	0.3053	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5549	0.5527	0.5507	0.5408	0.5390	0.5305	0.5305	0.5289	0.5338	0.5390	0.5427	0.5466	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			7.3400	1.1450	8.4046			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Terrace Floor			5.7100	0.1400	0.7994	0.0000	0.0000	(28b)
Brickwork	56.2700	18.7500	37.5200	0.2100	7.8792	110.0000	4127.2001	(29a)
Communal Wall	6.6000	2.0600	4.5400	0.2200	0.9988	110.0000	499.4000	(29a)
Stairwell Wall	14.3400		14.3400	0.1600	2.2944	110.0000	1577.4000	(29a)
Plane Roof	78.7800		78.7800	0.0900	7.0902	9.0000	709.0200	(30)
Total net area of external elements Aum(A, m2)			161.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.0384			(33)
Main dwelling								
Party Wall 1			30.9300	0.0000	0.0000	110.0000	3402.3000	(32)
Party Floor 1			73.0700			70.0000	5114.9000	(32d)
Internal Wall 1			156.9000			9.0000	1412.0999	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16842.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7893 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.3700	0.0380	0.6601
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.2500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
E16 Corner (normal)	8.2500	0.0540	0.4455
P4 Party wall - Roof (insulation at ceiling level)	11.2500	0.1010	1.1362
E10 Eaves (insulation at ceiling level)	18.1600	0.0630	1.1441
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E12 Gable (insulation at ceiling level)	11.5500	0.0980	1.1319
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0970	-0.5335
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705
E2 Other lintels (including other steel lintels)	9.8400	0.0500	0.4920
E4 Jamb	29.2900	0.0160	0.4686
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2008 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.2392 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6204	34.4875	34.3572	33.7451	33.6306	33.0975	33.0975	32.9988	33.3029	33.6306	33.8623	34.1044	(38)
Heat transfer coeff	88.8596	88.7267	88.5964	87.9843	87.8698	87.3367	87.3367	87.2380	87.5421	87.8698	88.1015	88.3437	(39)
Average = Sum(39)m / 12 =												87.9838	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1279	1.1263	1.1246	1.1168	1.1154	1.1086	1.1086	1.1074	1.1112	1.1154	1.1183	1.1214	(40)
HLP (average)												1.1168	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4393 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.1265	27.7087	27.1205	26.0359	25.2238	24.3232	23.8368	24.4209	25.0569	26.0205	27.1275	28.0314	(42b)
Hot water usage for other uses	39.6109	38.1705	36.7301	35.2897	33.8493	32.4089	32.4089	33.8493	35.2897	36.7301	38.1705	39.6109	(42c)
Average daily hot water use (litres/day)												62.0876	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.7374	65.8793	63.8506	61.3256	59.0731	56.7322	56.2458	58.2703	60.3467	62.7507	65.2980	67.6423	(44)
Energy conte	107.2794	93.8112	98.1360	83.9517	79.5238	69.7588	68.0244	72.1508	74.4135	85.1521	93.0290	105.9115	(45)
Energy content (annual)										Total = Sum(45)m =		1031.1421	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.1875	79.7395	83.4156	71.3590	67.5952	59.2950	57.8207	61.3282	63.2515	72.3792	79.0746	90.0248	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.1875	79.7395	83.4156	71.3590	67.5952	59.2950	57.8207	61.3282	63.2515	72.3792	79.0746	90.0248	(64)
									Total per year (kWh/year) = Sum(64)m =			876.4708	(64)
12Total per year (kWh/year)												876	(64)
Electric shower(s)	52.1493	46.4655	50.7385	48.4192	49.3277	47.0539	48.6223	49.3277	48.4192	50.7385	49.7844	52.1493	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							593.1955	(64a)
Heat gains from water heating, kWh/month	35.8342	31.5512	33.5385	29.9445	29.2307	26.5872	26.6108	27.6640	27.9177	30.7794	32.2148	35.5435	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.3869	121.1070	109.3869	113.0332	109.3869	113.0332	109.3869	109.3869	113.0332	109.3869	113.0332	109.3869	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.8719	219.1223	213.4512	201.3782	186.1382	171.8147	162.2458	159.9953	165.6664	177.7394	192.9794	207.3029	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	(71)
Water heating gains (Table 5)	48.1643	46.9513	45.0787	41.5896	39.2886	36.9267	35.7671	37.1828	38.7745	41.3702	44.7427	47.7735	(72)
Total internal gains	434.0126	446.7701	427.5064	415.5906	394.4033	381.3642	366.9894	366.1546	377.0636	388.0861	410.3449	424.0530	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.3400	46.7521	0.3300	0.0000	0.7700	87.1970	(78)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)

Solar gains	140.6886	247.4471	354.2384	456.9285	522.2609	521.4907	501.6391	453.4942	390.4515	278.1951	170.0559	119.3351	(83)
Total gains	574.7012	694.2172	781.7448	872.5191	916.6642	902.8549	868.6286	819.6487	767.5152	666.2812	580.4008	543.3881	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.6496	52.7285	52.8060	53.1734	53.2427	53.5676	53.5676	53.6282	53.4420	53.2427	53.1027	52.9571	
alpha	4.5100	4.5152	4.5204	4.5449	4.5495	4.5712	4.5712	4.5752	4.5628	4.5495	4.5402	4.5305	
util living area	0.9915	0.9799	0.9557	0.8907	0.7698	0.5908	0.4364	0.4799	0.7107	0.9222	0.9820	0.9933	(86)
MIT	19.5888	19.8445	20.1696	20.5552	20.8273	20.9604	20.9919	20.9877	20.9092	20.5366	19.9874	19.5401	(87)
Th 2	19.9781	19.9794	19.9808	19.9871	19.9883	19.9938	19.9938	19.9948	19.9917	19.9883	19.9859	19.9834	(88)
util rest of house	0.9891	0.9744	0.9437	0.8622	0.7150	0.5087	0.3396	0.3797	0.6316	0.8952	0.9762	0.9914	(89)
MIT 2	18.7050	18.9580	19.2755	19.6417	19.8755	19.9755	19.9916	19.9911	19.9437	19.6346	19.1063	18.6608	(90)
Living area fraction										fLA = Living area / (4) =		0.3474	(91)
MIT	19.0121	19.2660	19.5861	19.9591	20.2062	20.3177	20.3391	20.3373	20.2791	19.9480	19.4124	18.9663	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0121	19.2660	19.5861	19.9591	20.2062	20.3177	20.3391	20.3373	20.2791	19.9480	19.4124	18.9663	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9861	0.9696	0.9381	0.8613	0.7276	0.5360	0.3733	0.4145	0.6556	0.8939	0.9719	0.9889	(94)
Useful gains	566.7051	673.1406	733.3799	751.4863	666.9956	483.9002	324.2245	339.7244	503.1845	595.6052	564.1144	537.3423	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1307.3074	1274.6469	1159.3829	973.0273	747.4368	499.3615	326.5629	343.4854	540.9354	821.4071	1084.7405	1304.5080	(97)
Space heating kWh	551.0081	404.2123	316.9462	159.5095	59.8483	0.0000	0.0000	0.0000	0.0000	167.9967	374.8508	570.7712	(98a)
Space heating requirement - total per year (kWh/year)												2605.1431	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	551.0081	404.2123	316.9462	159.5095	59.8483	0.0000	0.0000	0.0000	0.0000	167.9967	374.8508	570.7712	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2605.1431	
Space heating per m2											(98c) / (4) =	33.0686	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	820.9654	646.2919	663.0090	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8950	0.9428	0.9257	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	734.7466	609.3430	613.7505	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1013.3334	975.4594	920.3436	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	200.5825	272.3906	228.1053	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	50.1456	68.0977	57.0263	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												175.2696	(107)
Energy for space heating												33.0686	(99)
Energy for space cooling												2.2248	(108)
Total												35.2934	(109)
Fabric Energy Efficiency (DFEE)												35.3	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.7800	(1b)	x 2.4000	(2b) =	189.0720	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		189.0720	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)

Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1587 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4087 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3474 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4429	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3474	0.3734	0.3908	0.4082	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5981	0.5943	0.5905	0.5730	0.5697	0.5545	0.5545	0.5516	0.5603	0.5697	0.5764	0.5833	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.6500	1.1450	20.2099			(27)
Terrace Floor			5.7100	0.1300	0.7423			(28b)
Brickwork	56.2700	17.6500	38.6200	0.1800	6.9516			(29a)
Communal Wall	6.6000	2.0600	4.5400	0.1800	0.8172			(29a)
Stairwell Wall	14.3400		14.3400	0.1800	2.5812			(29a)
Plane Roof	78.7800		78.7800	0.1100	8.6658			(30)
Total net area of external elements Aum(A, m2)			161.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.0280			(33)
Main dwelling								
Party Wall 1			30.9300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7893 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.3700	0.0700	1.2159
E18 Party wall between dwellings	5.5000	0.0600	0.3300
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.2500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.0200	0.0800
E16 Corner (normal)	8.2500	0.0900	0.7425
P4 Party wall - Roof (insulation at ceiling level)	11.2500	0.1200	1.3500
E10 Eaves (insulation at ceiling level)	18.1600	0.0600	1.0896
E20 Exposed floor (normal)	6.7700	0.3200	2.1664
E12 Gable (insulation at ceiling level)	11.5500	0.0600	0.6930
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0900	-0.4950
E25 Staggered party wall between dwellings	5.5000	0.0600	0.3300
E2 Other lintels (including other steel lintels)	9.8400	0.0500	0.4920
E4 Jamb	29.2900	0.0500	1.4645
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.3789 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	55.4069 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.3164	37.0787	36.8458	35.7518	35.5471	34.5942	34.5942	34.4178	34.9613	35.5471	35.9612	36.3941	(38)
Heat transfer coeff	92.7233	92.4857	92.2527	91.1587	90.9540	90.0012	90.0012	89.8247	90.3682	90.9540	91.3681	91.8010	(39)
Average = Sum(39)m / 12 =												91.1577	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1770	1.1740	1.1710	1.1571	1.1545	1.1424	1.1424	1.1402	1.1471	1.1545	1.1598	1.1653	(40)
HLP (average)												1.1571	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4393 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.1265	27.7087	27.1205	26.0359	25.2238	24.3232	23.8368	24.4209	25.0569	26.0205	27.1275	28.0314	(42b)
Hot water usage for other uses	39.6109	38.1705	36.7301	35.2897	33.8493	32.4089	32.4089	33.8493	35.2897	36.7301	38.1705	39.6109	(42c)
Average daily hot water use (litres/day)												62.0876	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.7374	65.8793	63.8506	61.3256	59.0731	56.7322	56.2458	58.2703	60.3467	62.7507	65.2980	67.6423	(44)
Energy conte	107.2794	93.8112	98.1360	83.9517	79.5238	69.7588	68.0244	72.1508	74.4135	85.1521	93.0290	105.9115	(45)
Energy content (annual)										Total = Sum(45)m =		1031.1421	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.1875	79.7395	83.4156	71.3590	67.5952	59.2950	57.8207	61.3282	63.2515	72.3792	79.0746	90.0248	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.1875	79.7395	83.4156	71.3590	67.5952	59.2950	57.8207	61.3282	63.2515	72.3792	79.0746	90.0248	(64)
											Total per year (kWh/year) = Sum(64)m =	876.4708	(64)
12Total per year (kWh/year)												876	(64)
Electric shower(s)	52.1493	46.4655	50.7385	48.4192	49.3277	47.0539	48.6223	49.3277	48.4192	50.7385	49.7844	52.1493	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	593.1955	(64a)
Heat gains from water heating, kWh/month	35.8342	31.5512	33.5385	29.9445	29.2307	26.5872	26.6108	27.6640	27.9177	30.7794	32.2148	35.5435	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.3777	121.0967	109.3777	113.0236	109.3777	113.0236	109.3777	109.3777	113.0236	109.3777	113.0236	109.3777	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.8719	219.1223	213.4512	201.3782	186.1382	171.8147	162.2458	159.9953	165.6664	177.7394	192.9794	207.3029	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	(71)
Water heating gains (Table 5)	48.1643	46.9513	45.0787	41.5896	39.2886	36.9267	35.7671	37.1828	38.7745	41.3702	44.7427	47.7735	(72)
Total internal gains	434.0034	446.7598	427.4972	415.5810	394.3940	381.3546	366.9801	366.1453	377.0540	388.0768	410.3353	424.0437	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.7300	19.6403	0.6300	0.7000	0.7700	64.4049	(76)
South	6.9200	46.7521	0.6300	0.7000	0.7700	98.8732	(78)

Solar gains	163.2781	287.9185	413.7556	535.7357	613.7909	613.4289	589.8588	532.2990	456.7879	324.1528	197.5038	138.3990	(83)
Total gains	597.2815	734.6783	841.2528	951.3167	1008.1849	994.7835	956.8390	898.4443	833.8420	712.2296	607.8391	562.4427	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.4557	50.5854	50.7131	51.3217	51.4372	51.9818	51.9818	52.0839	51.7707	51.4372	51.2041	50.9626	
alpha	4.3637	4.3724	4.3809	4.4214	4.4291	4.4655	4.4655	4.4723	4.4514	4.4291	4.4136	4.3975	
util living area	0.9903	0.9764	0.9470	0.8704	0.7380	0.5567	0.4091	0.4521	0.6827	0.9105	0.9794	0.9924	(86)
MIT	19.5376	19.8200	20.1722	20.5780	20.8436	20.9657	20.9930	20.9892	20.9166	20.5434	19.9653	19.4926	(87)
Th 2	19.9385	19.9409	19.9433	19.9544	19.9565	19.9663	19.9663	19.9681	19.9626	19.9565	19.9523	19.9479	(88)
util rest of house	0.9876	0.9701	0.9329	0.8382	0.6803	0.4754	0.3154	0.3544	0.6018	0.8804	0.9729	0.9903	(89)
MIT 2	18.6240	18.9036	19.2466	19.6318	19.8565	19.9508	19.9644	19.9650	19.9195	19.6127	19.0583	18.5866	(90)
Living area fraction										fLA = Living area / (4) =		0.3474	(91)
MIT	18.9414	19.2220	19.5682	19.9605	20.1995	20.3034	20.3218	20.3208	20.2659	19.9360	19.3734	18.9013	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9414	19.2220	19.5682	19.9605	20.1995	20.3034	20.3218	20.3208	20.2659	19.9360	19.3734	18.9013	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9647	0.9270	0.8384	0.6945	0.5026	0.3480	0.3884	0.6268	0.8797	0.9682	0.9875	(94)
Useful gains	587.8695	708.7207	779.8359	797.6230	700.2202	500.0139	332.9527	348.9173	522.6332	626.5324	588.4842	555.3925	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1357.5967	1324.5756	1205.5736	1008.2637	773.0617	513.3167	334.9652	352.1855	557.2006	849.1490	1121.4000	1349.5964	(97)
Space heating kWh	572.6770	413.8545	316.7489	151.6613	54.1941	0.0000	0.0000	0.0000	0.0000	165.6268	383.6994	590.8877	(98a)
Space heating requirement - total per year (kWh/year)												2649.3496	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	572.6770	413.8545	316.7489	151.6613	54.1941	0.0000	0.0000	0.0000	0.0000	165.6268	383.6994	590.8877	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2649.3496	
Space heating per m2											(98c) / (4) =	33.6297	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	846.0109	666.0086	682.6678	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9111	0.9521	0.9368	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	770.7610	634.1286	639.5187	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1120.7928	1078.5725	1012.4520	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	252.0229	330.6662	277.4624	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)

Intermittency factor (Table 10b)

0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	63.0057	82.6666	69.3656	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement	215.0379 (107)
Energy for space heating	33.6297 (99)
Energy for space cooling	2.7296 (108)
Total	36.3593 (109)
Fabric Energy Efficiency (TFEE)	36.4 (109)

Full SAP Calculation Printout

Plot Reference	P-30	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-30
Plot Address	Flat 10, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	4.83	**TER**	12.85
Environmental	96 A	**% DER < TER**			62.41
CO_2 Emissions (t/year)	0.31	**DFEE**	35.29	**TFEE**	36.36
Compliance Check	See BREL	**% DFEE < TFEE**			2.93
% DPER < TPER	26.74	**DPER**	49.80	**TPER**	67.97

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.7800	(1b)	x 2.4000	(2b) =	189.0720	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.0720	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9400 (17)
Infiltration rate		0.1470 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1249 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1593	0.1562	0.1531	0.1374	0.1343	0.1187	0.1187	0.1156	0.1249	0.1343	0.1406	0.1468	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2953	0.2922	0.2891	0.2734	0.2703	0.2547	0.2547	0.2516	0.2610	0.2703	0.2766	0.2828	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			7.3400	1.1450	8.4046			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Terrace Floor			5.7100	0.1400	0.7994	0.0000	0.0000	(28b)
Brickwork	56.2700	18.7500	37.5200	0.2100	7.8792	110.0000	4127.2001	(29a)
Communal Wall	6.6000	2.0600	4.5400	0.2200	0.9988	110.0000	499.4000	(29a)
Stairwell Wall	14.3400		14.3400	0.1600	2.2944	110.0000	1577.4000	(29a)
Plane Roof	78.7800		78.7800	0.0900	7.0902	9.0000	709.0200	(30)
Total net area of external elements Aum(A, m2)			161.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.0384			(33)
Main dwelling								
Party Wall 1			30.9300	0.0000	0.0000	110.0000	3402.3000	(32)
Party Floor 1			73.0700			70.0000	5114.9000	(32d)
Internal Wall 1			156.9000			9.0000	1412.0999	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16842.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7893 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	17.3700	0.0380	0.6601
E18	Party wall between dwellings	5.5000	0.0380	0.2090
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	11.2500	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
E16	Corner (normal)	8.2500	0.0540	0.4455
P4	Party wall - Roof (insulation at ceiling level)	11.2500	0.1010	1.1362
E10	Eaves (insulation at ceiling level)	18.1600	0.0630	1.1441
E20	Exposed floor (normal)	6.7700	0.1200	0.8124
E12	Gable (insulation at ceiling level)	11.5500	0.0980	1.1319
E17	Corner (inverted - internal area greater than external area)	5.5000	-0.0970	-0.5335
E25	Staggered party wall between dwellings	5.5000	0.0310	0.1705
E2	Other lintels (including other steel lintels)	9.8400	0.0500	0.4920
E4	Jamb	29.2900	0.0160	0.4686
E5	Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2008 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.2392 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.4256	18.2307	18.0358	17.0613	16.8664	15.8918	15.8918	15.6969	16.2817	16.8664	17.2562	17.6460	(38)
Heat transfer coeff	72.6648	72.4699	72.2750	71.3005	71.1056	70.1311	70.1311	69.9362	70.5209	71.1056	71.4954	71.8852	(39)

Average = Sum(39)m / 12 = 71.2518

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9224	0.9199	0.9174	0.9051	0.9026	0.8902	0.8902	0.8877	0.8952	0.9026	0.9075	0.9125	(40)
HLP (average)												0.9044	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4393 (42)
Hot water usage for mixer showers

65.1188	64.1402	62.7142	59.9857	57.9722	55.7268	54.4504	55.8657	57.4170	59.8280	62.6150	64.8693	(42a)

Hot water usage for baths

28.1265	27.7087	27.1205	26.0359	25.2238	24.3232	23.8368	24.4209	25.0569	26.0205	27.1275	28.0314	(42b)

Hot water usage for other uses

39.6109	38.1705	36.7301	35.2897	33.8493	32.4089	32.4089	33.8493	35.2897	36.7301	38.1705	39.6109	(42c)

Average daily hot water use (litres/day) 122.1250 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.8562	130.0195	126.5648	121.3114	117.0453	112.4589	110.6962	114.1360	117.7637	122.5786	127.9130	132.5116	(44)
Energy conte	210.4117	185.1460	194.5254	166.0692	157.5655	138.2814	133.8775	141.3241	145.2144	166.3381	182.2355	207.4812	(45)
Energy content (annual)										Total = Sum(45)m =		2028.4701	
Distribution loss (46)m = 0.15 x (45)m	31.5618	27.7719	29.1788	24.9104	23.6348	20.7422	20.0816	21.1986	21.7822	24.9507	27.3353	31.1222	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)
										Total per year (kWh/year) = Sum(64)m =		2373.3951	(64)
12Total per year (kWh/year)												2373	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	69.9619	61.5610	64.6797	55.2180	52.3905	45.9786	44.5143	46.9903	48.2838	55.3074	60.5933	68.9875	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.3869	121.1070	109.3869	113.0332	109.3869	113.0332	109.3869	109.3869	113.0332	109.3869	113.0332	109.3869	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.8719	219.1223	213.4512	201.3782	186.1382	171.8147	162.2458	159.9953	165.6664	177.7394	192.9794	207.3029	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	(71)
Water heating gains (Table 5)	94.0348	91.6087	86.9351	76.6917	70.4174	63.8591	59.8310	63.1590	67.0608	74.3379	84.1574	92.7251	(72)
Total internal gains	479.8832	491.4276	469.3628	450.6927	425.5321	408.2966	391.0533	392.1308	405.3500	421.0538	449.7596	469.0045	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
South	7.3400	46.7521	0.3300	0.0000	0.7700	87.1970	(78)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	140.6886	247.4471	354.2384	456.9285	522.2609	521.4907	501.6391	453.4942	390.4515	278.1951	170.0559	119.3351	(83)
Total gains	620.5718	738.8746	823.6012	907.6212	947.7930	929.7873	892.6924	845.6250	795.8015	699.2489	619.8154	588.3396	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.3836	64.5568	64.7309	65.6156	65.7954	66.7097	66.7097	66.8956	66.3410	65.7954	65.4367	65.0819	
alpha	5.2922	5.3038	5.3154	5.3744	5.3864	5.4473	5.4473	5.4597	5.4227	5.3864	5.3624	5.3388	
util living area	0.9857	0.9656	0.9239	0.8210	0.6640	0.4780	0.3450	0.3792	0.5942	0.8660	0.9685	0.9889	(86)
MIT	20.0298	20.2688	20.5367	20.8097	20.9482	20.9928	20.9990	20.9983	20.9778	20.7832	20.3636	19.9888	(87)
Th 2	20.1485	20.1506	20.1527	20.1632	20.1653	20.1758	20.1758	20.1779	20.1716	20.1653	20.1611	20.1569	(88)
util rest of house	0.9821	0.9575	0.9070	0.7873	0.6138	0.4184	0.2807	0.3121	0.5293	0.8315	0.9597	0.9860	(89)
MIT 2	19.0270	19.3273	19.6563	19.9795	20.1234	20.1716	20.1755	20.1773	20.1571	19.9602	19.4576	18.9815	(90)
Living area fraction									fLA = Living area / (4) =			0.3474	(91)
MIT	19.3754	19.6544	19.9622	20.2679	20.4100	20.4569	20.4616	20.4625	20.4422	20.2461	19.7724	19.3315	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3754	19.6544	19.9622	20.2679	20.4100	20.4569	20.4616	20.4625	20.4422	20.2461	19.7724	19.3315	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9780	0.9518	0.9028	0.7918	0.6289	0.4389	0.3031	0.3354	0.5509	0.8352	0.9547	0.9824	(94)
Useful gains	606.8951	703.2574	743.5127	718.6685	596.1010	408.0598	270.5316	283.6282	438.4294	583.9919	591.7410	577.9743	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1095.4521	1069.2504	972.9788	810.5387	619.3291	410.7507	270.8160	284.1179	447.2571	685.8929	906.0160	1087.7297	(97)
Space heating kWh	363.4865	245.9474	170.7228	66.1465	17.2817	0.0000	0.0000	0.0000	0.0000	75.8143	226.2780	379.2581	(98a)
Space heating requirement - total per year (kWh/year)												1544.9352	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	363.4865	245.9474	170.7228	66.1465	17.2817	0.0000	0.0000	0.0000	0.0000	75.8143	226.2780	379.2581	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1544.9352	
Space heating per m2											(98c) / (4) =	19.6108	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	363.4865	245.9474	170.7228	66.1465	17.2817	0.0000	0.0000	0.0000	0.0000	75.8143	226.2780	379.2581	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	363.4865	245.9474	170.7228	66.1465	17.2817	0.0000	0.0000	0.0000	0.0000	75.8143	226.2780	379.2581	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	66.2787	58.5088	61.8861	53.7567	51.6667	46.0734	45.1170	47.1760	47.9904	54.0923	58.2267	65.4684	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.5097	10.3959	11.5097	11.1384	11.5097	11.1384	11.5097	11.5097	11.1384	11.5097	11.1384	11.5097	(231)
Lighting	22.2639	17.8609	16.0818	11.7822	9.1009	7.4355	8.3022	10.7915	14.0170	18.3911	20.7727	22.8827	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1544.9352	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	656.2413	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	135.5174	(230a)
Total electricity for the above, kWh/year	135.5174	(231)
Electricity for lighting (calculated in Appendix L)	179.6823	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2516.3762	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1544.9352	0.1571	242.7584	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	656.2413	0.1412	92.6361	(264)
Space and water heating			335.3945	(265)
Pumps, fans and electric keep-hot	135.5174	0.1387	18.7979	(267)
Energy for lighting	179.6823	0.1443	25.9337	(268)
Total CO2, kg/year			380.1261	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1544.9352	1.5817	2443.5907	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	656.2413	1.5220	998.7845	(278)
Space and water heating			3442.3752	(279)
Pumps, fans and electric keep-hot	135.5174	1.5128	205.0107	(281)
Energy for lighting	179.6823	1.5338	275.6028	(282)
Total Primary energy kWh/year			3922.9886	(286)
Dwelling Primary energy Rate (DPER)			49.8000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.7800	(1b)	x 2.4000	(2b) =	189.0720	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		189.0720	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1587	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4087	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3474	(21)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4429	0.4342	0.4255	0.3821	0.3734	0.3300	0.3300	0.3213	0.3474	0.3734	0.3908	0.4082 (22b)
Effective ac	0.5981	0.5943	0.5905	0.5730	0.5697	0.5545	0.5545	0.5516	0.5603	0.5697	0.5764	0.5833 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			17.6500	1.1450	20.2099			(27)
Terrace Floor			5.7100	0.1300	0.7423			(28b)
Brickwork	56.2700	17.6500	38.6200	0.1800	6.9516			(29a)
Communal Wall	6.6000	2.0600	4.5400	0.1800	0.8172			(29a)
Stairwell Wall	14.3400		14.3400	0.1800	2.5812			(29a)
Plane Roof	78.7800		78.7800	0.1100	8.6658			(30)
Total net area of external elements Aum(A, m2)			161.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.0280			(33)
Main dwelling								
Party Wall 1			30.9300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7893 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.3700	0.0700	1.2159
E18 Party wall between dwellings	5.5000	0.0600	0.3300
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.2500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.0200	0.0800
E16 Corner (normal)	8.2500	0.0900	0.7425
P4 Party wall - Roof (insulation at ceiling level)	11.2500	0.1200	1.3500
E10 Eaves (insulation at ceiling level)	18.1600	0.0600	1.0896
E20 Exposed floor (normal)	6.7700	0.3200	2.1664
E12 Gable (insulation at ceiling level)	11.5500	0.0600	0.6930
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0900	-0.4950
E25 Staggered party wall between dwellings	5.5000	0.0600	0.3300
E2 Other lintels (including other steel lintels)	9.8400	0.0500	0.4920
E4 Jamb	29.2900	0.0500	1.4645
E5 Ground floor (normal)	24.5000	0.1600	3.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.3789 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 55.4069 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.3164	37.0787	36.8458	35.7518	35.5471	34.5942	34.5942	34.4178	34.9613	35.5471	35.9612	36.3941	(38)
Heat transfer coeff	92.7233	92.4857	92.2527	91.1587	90.9540	90.0012	90.0012	89.8247	90.3682	90.9540	91.3681	91.8010	(39)
Average = Sum(39)m / 12 =												91.1577	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1770	1.1740	1.1710	1.1571	1.1545	1.1424	1.1424	1.1402	1.1471	1.1545	1.1598	1.1653	(40)
HLP (average)												1.1571	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4393 (42)

Hot water usage for mixer showers

65.1188	64.1402	62.7142	59.9857	57.9722	55.7268	54.4504	55.8657	57.4170	59.8280	62.6150	64.8693	(42a)

Hot water usage for baths

28.1265	27.7087	27.1205	26.0359	25.2238	24.3232	23.8368	24.4209	25.0569	26.0205	27.1275	28.0314	(42b)

Hot water usage for other uses

39.6109	38.1705	36.7301	35.2897	33.8493	32.4089	32.4089	33.8493	35.2897	36.7301	38.1705	39.6109	(42c)

Average daily hot water use (litres/day) 122.1250 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.8562	130.0195	126.5648	121.3114	117.0453	112.4589	110.6962	114.1360	117.7637	122.5786	127.9130	132.5116	(44)
Energy conte	210.4117	185.1460	194.5254	166.0692	157.5655	138.2814	133.8775	141.3241	145.2144	166.3381	182.2355	207.4812	(45)
Energy content (annual)											Total = Sum(45)m =	2028.4701	
Distribution loss (46)m = 0.15 x (45)m	31.5618	27.7719	29.1788	24.9104	23.6348	20.7422	20.0816	21.1986	21.7822	24.9507	27.3353	31.1222	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

257.0066	227.2317	241.1203	211.1611	204.1604	183.3732	180.4724	187.9191	190.3063	212.9330	227.3274	254.0761	(62)
WWHRS -29.7696	-26.3285	-27.5697	-22.8288	-21.2756	-18.2057	-17.0649	-18.1468	-18.8363	-22.2059	-25.1566	-29.2183	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	227.2370	200.9032	213.5506	188.3323	182.8848	165.1675	163.4074	169.7722	171.4700	190.7270	202.1708	224.8577	(64)
										Total per year (kWh/year) = Sum(64)m =		2300.4807	(64)
12Total per year (kWh/year)												2300	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

107.2378	95.2296	101.9556	91.2915	89.6665	82.0520	81.7902	84.2662	84.3573	92.5833	96.6668	106.2634	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	121.9652	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	109.3777	121.0967	109.3777	113.0236	109.3777	113.0236	109.3777	109.3777	113.0236	109.3777	113.0236	109.3777	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	216.8719	219.1223	213.4512	201.3782	186.1382	171.8147	162.2458	159.9953	165.6664	177.7394	192.9794	207.3029	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	35.1965	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	(71)

Water heating gains (Table 5)

	144.1369	141.7107	137.0371	126.7937	120.5194	113.9612	109.9330	113.2610	117.1629	124.4400	134.2594	142.8272	(72)

Total internal gains

	532.9760	544.5193	522.4556	503.7851	478.6249	458.3890	441.1460	442.2236	455.4424	474.1466	502.8520	522.0973	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.7300	19.6403	0.6300	0.7000	0.7700	64.4049	(76)
South	6.9200	46.7521	0.6300	0.7000	0.7700	98.8732	(78)

Solar gains	163.2781	287.9185	413.7556	535.7357	613.7909	613.4289	589.8588	532.2990	456.7879	324.1528	197.5038	138.3990	(83)
Total gains	696.2541	832.4378	936.2112	1039.5209	1092.4157	1071.8180	1031.0049	974.5225	912.2303	798.2994	700.3558	660.4963	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.4557	50.5854	50.7131	51.3217	51.4372	51.9818	51.9818	52.0839	51.7707	51.4372	51.2041	50.9626	
alpha	4.3637	4.3724	4.3809	4.4214	4.4291	4.4655	4.4655	4.4723	4.4514	4.4291	4.4136	4.3975	
util living area													
	0.9829	0.9637	0.9263	0.8389	0.6993	0.5213	0.3808	0.4187	0.6380	0.8777	0.9662	0.9861	(86)
MIT	19.6795	19.9498	20.2802	20.6456	20.8742	20.9735	20.9947	20.9920	20.9362	20.6235	20.0901	19.6352	(87)
Th 2	19.9385	19.9409	19.9433	19.9544	19.9565	19.9663	19.9663	19.9681	19.9626	19.9565	19.9523	19.9479	(88)
util rest of house													
	0.9784	0.9546	0.9083	0.8027	0.6404	0.4435	0.2930	0.3274	0.5579	0.8409	0.9561	0.9824	(89)
MIT 2	18.4308	18.7706	19.1779	19.6132	19.8554	19.9512	19.9645	19.9652	19.9214	19.6025	18.9591	18.3817	(90)
Living area fraction									fLA = Living area / (4) =			0.3474	(91)
MIT	18.8646	19.1803	19.5609	19.9718	20.2094	20.3064	20.3225	20.3219	20.2740	19.9572	19.3521	18.8172	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8646	19.1803	19.5609	19.9718	20.2094	20.3064	20.3225	20.3219	20.2740	19.9572	19.3521	18.8172	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9723	0.9464	0.9006	0.8033	0.6554	0.4697	0.3235	0.3590	0.5830	0.8409	0.9487	0.9770	(94)
Useful gains	676.9749	787.7977	843.1447	835.0642	716.0068	503.3858	333.5278	349.9023	531.8572	671.3141	664.4345	645.3123	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1350.4821	1320.7209	1204.9009	1009.2951	773.9612	513.5811	335.0254	352.2871	557.9314	851.0764	1119.4479	1341.8719	(97)
Space heating kWh													
	501.0893	358.1244	269.1466	125.4462	43.1180	0.0000	0.0000	0.0000	0.0000	133.7431	327.6096	518.2403	(98a)
Space heating requirement - total per year (kWh/year)												2276.5176	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	501.0893	358.1244	269.1466	125.4462	43.1180	0.0000	0.0000	0.0000	0.0000	133.7431	327.6096	518.2403	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2276.5176	
Space heating per m2										(98c) / (4) =		28.8972	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	501.0893	358.1244	269.1466	125.4462	43.1180	0.0000	0.0000	0.0000	0.0000	133.7431	327.6096	518.2403	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	542.8920	388.0004	291.5997	135.9114	46.7151	0.0000	0.0000	0.0000	0.0000	144.9005	354.9400	561.4738	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	227.2370	200.9032	213.5506	188.3323	182.8848	165.1675	163.4074	169.7722	171.4700	190.7270	202.1708	224.8577	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7815	85.3410	84.5798	83.1700	81.3735	79.8000	79.8000	79.8000	79.8000	83.2791	85.1358	85.8695	(217)
Fuel for water heating, kWh/month													

	264.9020	235.4123	252.4842	226.4425	224.7475	206.9769	204.7712	212.7471	214.8746	229.0216	237.4685	261.8598 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.7265	18.2321	16.4159	12.0270	9.2900	7.5900	8.4747	11.0157	14.3083	18.7733	21.2044	23.3582 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-21.0095	-31.0745	-46.8345	-55.2972	-61.9384	-58.6530	-57.9295	-53.5358	-46.1982	-36.6773	-23.6061	-17.9976 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.8279	-16.8050	-34.0408	-52.0806	-69.8082	-70.4937	-69.6722	-58.5638	-42.3621	-24.3511	-10.5521	-6.1658 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2466.4329 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2771.7084 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	183.4160 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-973.4747 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4534.0826 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2466.4329	0.2100	517.9509	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2771.7084	0.2100	582.0588	(264)
Space and water heating			1100.0097	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	183.4160	0.1443	26.4726	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.7515	0.1336	-68.2325	
PV Unit electricity exported	-462.7232	0.1254	-58.0048	
Total			-126.2373	(269)
Total CO2, kg/year			1012.1743	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2466.4329	1.1300	2787.0692	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2771.7084	1.1300	3132.0305	(278)
Space and water heating			5919.0996	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	183.4160	1.5338	281.3296	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.7515	1.4937	-762.8984	
PV Unit electricity exported	-462.7232	0.4601	-212.9054	
Total			-975.8037	(283)
Total Primary energy kWh/year			5354.7263	(286)
Target Primary Energy Rate (TPER)			67.9700	(287)

Full SAP Calculation Printout

Plot Reference	P-30	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-30
Plot Address	Flat 10, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	82 B	**DER**	4.83	**TER**	12.85
Environmental	96 A	**% DER < TER**			62.41
CO_2 Emissions (t/year)	0.31	**DFEE**	35.29	**TFEE**	36.36
Compliance Check	See BREL	**% DFEE < TFEE**			2.93
% DPER < TPER	26.74	**DPER**	49.80	**TPER**	67.97

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.7800	(1b)	x 2.4000	(2b) =	189.0720	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7800					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	189.0720	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9400 (17)
Infiltration rate		0.1470 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1249 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1593	0.1562	0.1531	0.1374	0.1343	0.1187	0.1187	0.1156	0.1249	0.1343	0.1406	0.1468	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

Effective ac	0.2953	0.2922	0.2891	0.2734	0.2703	0.2547	0.2547	0.2516	0.2610	0.2703	0.2766	0.2828	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			7.3400	1.1450	8.4046			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Terrace Floor			5.7100	0.1400	0.7994	0.0000	0.0000	(28b)
Brickwork	56.2700	18.7500	37.5200	0.2100	7.8792	110.0000	4127.2001	(29a)
Communal Wall	6.6000	2.0600	4.5400	0.2200	0.9988	110.0000	499.4000	(29a)
Stairwell Wall	14.3400		14.3400	0.1600	2.2944	110.0000	1577.4000	(29a)
Plane Roof	78.7800		78.7800	0.0900	7.0902	9.0000	709.0200	(30)
Total net area of external elements Aum(A, m2)			161.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.0384			(33)
Main dwelling								
Party Wall 1			30.9300	0.0000	0.0000	110.0000	3402.3000	(32)
Party Floor 1			73.0700			70.0000	5114.9000	(32d)
Internal Wall 1			156.9000			9.0000	1412.0999	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16842.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7893 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	17.3700	0.0380	0.6601
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.2500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
E16 Corner (normal)	8.2500	0.0540	0.4455
P4 Party wall - Roof (insulation at ceiling level)	11.2500	0.1010	1.1362
E10 Eaves (insulation at ceiling level)	18.1600	0.0630	1.1441
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E12 Gable (insulation at ceiling level)	11.5500	0.0980	1.1319
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0970	-0.5335
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705
E2 Other lintels (including other steel lintels)	9.8400	0.0500	0.4920
E4 Jamb	29.2900	0.0160	0.4686
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2008 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.2392 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.4256	18.2307	18.0358	17.0613	16.8664	15.8918	15.8918	15.6969	16.2817	16.8664	17.2562	17.6460	(38)
Heat transfer coeff	72.6648	72.4699	72.2750	71.3005	71.1056	70.1311	70.1311	69.9362	70.5209	71.1056	71.4954	71.8852	(39)

Average = Sum(39)m / 12 = 71.2518

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9224	0.9199	0.9174	0.9051	0.9026	0.8902	0.8902	0.8877	0.8952	0.9026	0.9075	0.9125	(40)
HLP (average)												0.9044	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4393 (42)
Hot water usage for mixer showers

65.1188	64.1402	62.7142	59.9857	57.9722	55.7268	54.4504	55.8657	57.4170	59.8280	62.6150	64.8693	(42a)

Hot water usage for baths

28.1265	27.7087	27.1205	26.0359	25.2238	24.3232	23.8368	24.4209	25.0569	26.0205	27.1275	28.0314	(42b)

Hot water usage for other uses

39.6109	38.1705	36.7301	35.2897	33.8493	32.4089	32.4089	33.8493	35.2897	36.7301	38.1705	39.6109	(42c)

Average daily hot water use (litres/day) 122.1250 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.8562	130.0195	126.5648	121.3114	117.0453	112.4589	110.6962	114.1360	117.7637	122.5786	127.9130	132.5116	(44)
Energy conte	210.4117	185.1460	194.5254	166.0692	157.5655	138.2814	133.8775	141.3241	145.2144	166.3381	182.2355	207.4812	(45)

Energy content (annual) Total = Sum(45)m = 2028.4701
Distribution loss (46)m = 0.15 x (45)m

31.5618	27.7719	29.1788	24.9104	23.6348	20.7422	20.0816	21.1986	21.7822	24.9507	27.3353	31.1222	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9450 (55)
Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)

Total per year (kWh/year) = Sum(64)m = 2373.3951 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

69.9619	61.5610	64.6797	55.2180	52.3905	45.9786	44.5143	46.9903	48.2838	55.3074	60.5933	68.9875	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

25.4359	22.5919	18.3730	13.9095	10.3975	8.7780	9.4850	12.3289	16.5479	21.0113	24.5233	26.1428	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

323.6893	327.0482	318.5839	300.5645	277.8182	256.4399	242.1578	238.7990	247.2632	265.2827	288.0290	309.4073	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	(69)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Pumps, fans

Losses e.g. evaporation (negative values) (Table 5)

-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	(71)

Water heating gains (Table 5)

94.0348	91.6087	86.9351	76.6917	70.4174	63.8591	59.8310	63.1590	67.0608	74.3379	84.1574	92.7251	(72)

Total internal gains

544.0213	542.1101	524.7533	492.0270	459.4944	429.9383	412.3351	415.1481	431.7332	461.4932	497.5709	529.1365	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W

					W/m2	or Table 6b		or Table 6c		Table 6d			
South					7.3400	46.7521		0.3300		0.0000	0.7700	87.1970	(78)
East					11.4100	19.6403		0.3100		0.0000	0.7700	53.4916	(76)
Solar gains	140.6886	247.4471	354.2384	456.9285	522.2609	521.4907	501.6391	453.4942	390.4515	278.1951	170.0559	119.3351	(83)
Total gains	684.7099	789.5572	878.9916	948.9555	981.7553	951.4290	913.9742	868.6423	822.1847	739.6883	667.6268	648.4716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.3836	64.5568	64.7309	65.6156	65.7954	66.7097	66.7097	66.8956	66.3410	65.7954	65.4367	65.0819	
alpha	5.2922	5.3038	5.3154	5.3744	5.3864	5.4473	5.4473	5.4597	5.4227	5.3864	5.3624	5.3388	
util living area	0.9783	0.9555	0.9056	0.8004	0.6451	0.4676	0.3370	0.3693	0.5773	0.8433	0.9578	0.9829	(86)
MIT	20.1236	20.3348	20.5933	20.8330	20.9548	20.9935	20.9991	20.9985	20.9806	20.8127	20.4269	20.0787	(87)
Th 2	20.1485	20.1506	20.1527	20.1632	20.1653	20.1758	20.1758	20.1779	20.1716	20.1653	20.1611	20.1569	(88)
util rest of house	0.9731	0.9455	0.8860	0.7653	0.5953	0.4091	0.2742	0.3039	0.5134	0.8060	0.9465	0.9787	(89)
MIT 2	19.1445	19.4082	19.7221	20.0036	20.1290	20.1720	20.1755	20.1774	20.1590	19.9908	19.5346	19.0947	(90)
Living area fraction									fLA = Living area / (4) =			0.3474	(91)
MIT	19.4847	19.7301	20.0248	20.2917	20.4159	20.4574	20.4616	20.4627	20.4444	20.2764	19.8446	19.4365	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4847	19.7301	20.0248	20.2917	20.4159	20.4574	20.4616	20.4627	20.4444	20.2764	19.8446	19.4365	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9680	0.9397	0.8828	0.7710	0.6106	0.4292	0.2960	0.3266	0.5348	0.8114	0.9415	0.9742	(94)
Useful gains	662.8265	741.9116	775.9375	731.6102	599.4984	408.3721	270.5679	283.6980	439.7368	600.1526	628.5582	631.7551	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1103.3905	1074.7367	977.5038	812.2363	619.7492	410.7884	270.8207	284.1266	447.4160	688.0433	911.1798	1095.2815	(97)
Space heating kWh	327.7796	223.6585	149.9654	58.0508	15.0666	0.0000	0.0000	0.0000	0.0000	65.3907	203.4875	344.8637	(98a)
Space heating requirement - total per year (kWh/year)												1388.2627	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	327.7796	223.6585	149.9654	58.0508	15.0666	0.0000	0.0000	0.0000	0.0000	65.3907	203.4875	344.8637	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1388.2627	
Space heating per m2											(98c) / (4) =	17.6220	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	327.7796	223.6585	149.9654	58.0508	15.0666	0.0000	0.0000	0.0000	0.0000	65.3907	203.4875	344.8637	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	327.7796	223.6585	149.9654	58.0508	15.0666	0.0000	0.0000	0.0000	0.0000	65.3907	203.4875	344.8637	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	66.2787	58.5088	61.8861	53.7567	51.6667	46.0734	45.1170	47.1760	47.9904	54.0923	58.2267	65.4684	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.5097	10.3959	11.5097	11.1384	11.5097	11.1384	11.5097	11.5097	11.1384	11.5097	11.1384	11.5097	(231)
Lighting	22.2639	17.8609	16.0818	11.7822	9.1009	7.4355	8.3022	10.7915	14.0170	18.3911	20.7727	22.8827	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	1388.2627	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	656.2413	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	135.5174	(230a)
Total electricity for the above, kWh/year	135.5174	(231)
Electricity for lighting (calculated in Appendix L)	179.6823	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2359.7037	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1388.2627	16.4900	228.9245	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	656.2413	16.4900	108.2142	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	135.5174	16.4900	22.3468	(249)
Energy for lighting	179.6823	16.4900	29.6296	(250)
Additional standing charges			0.0000	(251)
Total energy cost			389.1151	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1317	(257)
SAP value		81.6552	
SAP rating (Section 12)		82	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1388.2627	0.1572	218.2807	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	656.2413	0.1412	92.6361	(264)
Space and water heating			310.9168	(265)
Pumps, fans and electric keep-hot	135.5174	0.1387	18.7979	(267)
Energy for lighting	179.6823	0.1443	25.9337	(268)
Total CO2, kg/year			355.6485	(272)
CO2 emissions per m2			4.5100	(273)
EI value			96.1499	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.7800	(1b)	x 2.4000	(2b) =	189.0720	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 78.7800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		189.0720	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9400	(17)
Infiltration rate		0.1470	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1249	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate													
	0.1343	0.1281	0.1281	0.1187	0.1218	0.1062	0.1062	0.1031	0.1062	0.1187	0.1156	0.1249	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2703	0.2641	0.2641	0.2547	0.2578	0.2422	0.2422	0.2391	0.2422	0.2547	0.2516	0.2610	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Window			7.3400	1.1450	8.4046			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Terrace Floor			5.7100	0.1400	0.7994	0.0000	0.0000	(28b)
Brickwork	56.2700	18.7500	37.5200	0.2100	7.8792	110.0000	4127.2001	(29a)
Communal Wall	6.6000	2.0600	4.5400	0.2200	0.9988	110.0000	499.4000	(29a)
Stairwell Wall	14.3400		14.3400	0.1600	2.2944	110.0000	1577.4000	(29a)
Plane Roof	78.7800		78.7800	0.0900	7.0902	9.0000	709.0200	(30)
Total net area of external elements Aum(A, m2)			161.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.0384			(33)
Main dwelling								
Party Wall 1			30.9300	0.0000	0.0000	110.0000	3402.3000	(32)
Party Floor 1			73.0700			70.0000	5114.9000	(32d)
Internal Wall 1			156.9000			9.0000	1412.0999	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16842.3200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7893	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.3700	0.0380	0.6601
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.2500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
E16 Corner (normal)	8.2500	0.0540	0.4455
P4 Party wall - Roof (insulation at ceiling level)	11.2500	0.1010	1.1362
E10 Eaves (insulation at ceiling level)	18.1600	0.0630	1.1441
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E12 Gable (insulation at ceiling level)	11.5500	0.0980	1.1319
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0970	-0.5335
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705
E2 Other lintels (including other steel lintels)	9.8400	0.0500	0.4920
E4 Jamb	29.2900	0.0160	0.4686
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.2008	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	54.2392	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.8664	16.4766	16.4766	15.8918	16.0867	15.1122	15.1122	14.9173	15.1122	15.8918	15.6969	16.2817	(38)
Heat transfer coeff													
	71.1056	70.7158	70.7158	70.1311	70.3260	69.3515	69.3515	69.1566	69.3515	70.1311	69.9362	70.5209	(39)
Average = Sum(39)m / 12 =												70.0661	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9026	0.8976	0.8976	0.8902	0.8927	0.8803	0.8803	0.8778	0.8803	0.8902	0.8877	0.8952	(40)
HLP (average)												0.8894	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4393	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.1188	64.1402	62.7142	59.9857	57.9722	55.7268	54.4504	55.8657	57.4170	59.8280	62.6150	64.8693	(42a)

Hot water usage for baths

28.1265	27.7087	27.1205	26.0359	25.2238	24.3232	23.8368	24.4209	25.0569	26.0205	27.1275	28.0314	(42b)

Hot water usage for other uses

39.6109	38.1705	36.7301	35.2897	33.8493	32.4089	32.4089	33.8493	35.2897	36.7301	38.1705	39.6109	(42c)

Average daily hot water use (litres/day)	122.1250	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	132.8562	130.0195	126.5648	121.3114	117.0453	112.4589	110.6962	114.1360	117.7637	122.5786	127.9130	132.5116	(44)
Energy conte	210.4117	185.1460	194.5254	166.0692	157.5655	138.2814	133.8775	141.3241	145.2144	166.3381	182.2355	207.4812	(45)
Energy content (annual)										Total = Sum(45)m =		2028.4701	
Distribution loss (46)m = 0.15 x (45)m													
	31.5618	27.7719	29.1788	24.9104	23.6348	20.7422	20.0816	21.1986	21.7822	24.9507	27.3353	31.1222	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.9450	(55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)
									Total per year (kWh/year) = Sum(64)m =			2373.3951	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	69.9619	61.5610	64.6797	55.2180	52.3905	45.9786	44.5143	46.9903	48.2838	55.3074	60.5933	68.9875	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.4359	22.5919	18.3730	13.9095	10.3975	8.7780	9.4850	12.3289	16.5479	21.0113	24.5233	26.1428	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	323.6893	327.0482	318.5839	300.5645	277.8182	256.4399	242.1578	238.7990	247.2632	265.2827	288.0290	309.4073	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	(71)
Water heating gains (Table 5)													
	94.0348	91.6087	86.9351	76.6917	70.4174	63.8591	59.8310	63.1590	67.0608	74.3379	84.1574	92.7251	(72)
Total internal gains													
	544.0213	542.1101	524.7533	492.0270	459.4944	429.9383	412.3351	415.1481	431.7332	461.4932	497.5709	529.1365	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.3400	54.2217	0.3300	0.0000	0.7700	101.1286	(78)
East	11.4100	23.8018	0.3100	0.0000	0.7700	64.8257	(76)

Solar gains	165.9543	255.0790	362.9755	476.8810	532.9230	563.8927	536.6552	495.9022	426.9514	307.8836	197.6026	141.5893	(83)
Total gains	709.9756	797.1890	887.7287	968.9079	992.4173	993.8309	948.9903	911.0503	858.6846	769.3767	695.1735	670.7258	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.7954	66.1581	66.1581	66.7097	66.5248	67.4596	67.4596	67.6497	67.4596	66.7097	66.8956	66.3410	
alpha	5.3864	5.4105	5.4105	5.4473	5.4350	5.4973	5.4973	5.5100	5.4973	5.4473	5.4597	5.4227	
util living area													
	0.9680	0.9413	0.8757	0.7400	0.5617	0.3620	0.2411	0.2580	0.4799	0.7783	0.9340	0.9743	(86)
MIT	20.2822	20.4626	20.7012	20.9003	20.9802	20.9986	20.9999	20.9998	20.9934	20.8905	20.5778	20.2414	(87)
Th 2	20.1653	20.1695	20.1695	20.1758	20.1737	20.1843	20.1843	20.1864	20.1843	20.1758	20.1779	20.1716	(88)
util rest of house													
	0.9603	0.9283	0.8511	0.6992	0.5085	0.3056	0.1815	0.1963	0.4167	0.7317	0.9170	0.9679	(89)
MIT 2	19.3563	19.5805	19.8629	20.0858	20.1594	20.1836	20.1842	20.1863	20.1806	20.0811	19.7315	19.3109	(90)
Living area fraction										fLA = Living area / (4) =		0.3474	(91)
MIT	19.6780	19.8870	20.1541	20.3687	20.4446	20.4667	20.4676	20.4690	20.4630	20.3623	20.0255	19.6341	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6780	19.8870	20.1541	20.3687	20.4446	20.4667	20.4676	20.4690	20.4630	20.3623	20.0255	19.6341	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9232	0.8506	0.7091	0.5262	0.3252	0.2022	0.2177	0.4385	0.7429	0.9134	0.9629	(94)
Useful gains	677.9907	735.9683	755.1199	687.0583	522.2179	323.1878	191.9146	198.3728	376.4991	571.5511	634.9601	645.8399	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1036.5761	1003.2428	901.9180	734.1845	530.5803	323.6457	191.9380	198.4077	378.8672	621.5249	841.0183	1024.9606	(97)
Space heating kWh													
	266.7875	179.6085	109.2178	33.9309	6.2216	0.0000	0.0000	0.0000	0.0000	37.1805	148.3619	282.0658	(98a)
Space heating requirement - total per year (kWh/year)												1063.3745	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	266.7875	179.6085	109.2178	33.9309	6.2216	0.0000	0.0000	0.0000	0.0000	37.1805	148.3619	282.0658	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1063.3745	
Space heating per m2											(98c) / (4) =	13.4980	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)

Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	266.7875	179.6085	109.2178	33.9309	6.2216	0.0000	0.0000	0.0000	0.0000	37.1805	148.3619	282.0658	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	266.7875	179.6085	109.2178	33.9309	6.2216	0.0000	0.0000	0.0000	0.0000	37.1805	148.3619	282.0658	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	66.2787	58.5088	61.8861	53.7567	51.6667	46.0734	45.1170	47.1760	47.9904	54.0923	58.2267	65.4684	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.5097	10.3959	11.5097	11.1384	11.5097	11.1384	11.5097	11.5097	11.1384	11.5097	11.1384	11.5097	(231)
Lighting	22.2639	17.8609	16.0818	11.7822	9.1009	7.4355	8.3022	10.7915	14.0170	18.3911	20.7727	22.8827	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1063.3745	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												656.2413	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												135.5174	(230a)
Total electricity for the above, kWh/year												135.5174	(231)
Electricity for lighting (calculated in Appendix L)												179.6823	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2034.8155	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1063.3745	27.6700	294.2357	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	656.2413	27.6700	181.5820	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	135.5174	27.6700	37.4977	(249)
Energy for lighting	179.6823	27.6700	49.7181	(250)
Additional standing charges			0.0000	(251)
Total energy cost			563.0335	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1063.3745	0.1580	168.0433	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	656.2413	0.1412	92.6361	(264)
Space and water heating			260.6794	(265)
Pumps, fans and electric keep-hot	135.5174	0.1387	18.7979	(267)
Energy for lighting	179.6823	0.1443	25.9337	(268)
Total CO2, kg/year			305.4111	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	

Space heating - main system 1	1063.3745	1.5850	1685.4301	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	656.2413	1.5220	998.7845	(278)
Space and water heating			2684.2147	(279)
Pumps, fans and electric keep-hot	135.5174	1.5128	205.0107	(281)
Energy for lighting	179.6823	1.5338	275.6028	(282)
Total Primary energy kWh/year			3164.8281	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 82
Current environmental impact rating: A 96

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 82
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£563	£563	£0
Space heating	£332	£332	£0
Water heating	£182	£182	£0
Lighting	£50	£50	£0
Total cost of fuels	£563	£563	£0
Total cost of uses	£564	£564	£0
Delivered energy	26 kWh/m²	26 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	40 kWh/m²	40 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.7800 (1b)	x	2.4000 (2b)	=	189.0720	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	189.0720	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9400	(17)
Infiltration rate		0.1470	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1249	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1593	0.1562	0.1531	0.1374	0.1343	0.1187	0.1187	0.1156	0.1249	0.1343	0.1406	0.1468	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.8000 (23c)

Effective ac	0.2953	0.2922	0.2891	0.2734	0.2703	0.2547	0.2547	0.2516	0.2610	0.2703	0.2766	0.2828	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			7.3400	1.1450	8.4046			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Terrace Floor			5.7100	0.1400	0.7994	0.0000	0.0000	(28b)
Brickwork	56.2700	18.7500	37.5200	0.2100	7.8792	110.0000	4127.2001	(29a)
Communal Wall	6.6000	2.0600	4.5400	0.2200	0.9988	110.0000	499.4000	(29a)
Stairwell Wall	14.3400		14.3400	0.1600	2.2944	110.0000	1577.4000	(29a)
Plane Roof	78.7800		78.7800	0.0900	7.0902	9.0000	709.0200	(30)
Total net area of external elements Aum(A, m2)			161.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.0384			(33)
Main dwelling								
Party Wall 1			30.9300	0.0000	0.0000	110.0000	3402.3000	(32)
Party Floor 1			73.0700			70.0000	5114.9000	(32d)
Internal Wall 1			156.9000			9.0000	1412.0999	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16842.3200 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7893 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.3700	0.0380	0.6601
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.2500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
E16 Corner (normal)	8.2500	0.0540	0.4455
P4 Party wall - Roof (insulation at ceiling level)	11.2500	0.1010	1.1362
E10 Eaves (insulation at ceiling level)	18.1600	0.0630	1.1441
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E12 Gable (insulation at ceiling level)	11.5500	0.0980	1.1319
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0970	-0.5335
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705
E2 Other lintels (including other steel lintels)	9.8400	0.0500	0.4920
E4 Jamb	29.2900	0.0160	0.4686
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2008 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 54.2392 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.4256	18.2307	18.0358	17.0613	16.8664	15.8918	15.8918	15.6969	16.2817	16.8664	17.2562	17.6460	(38)
Heat transfer coeff	72.6648	72.4699	72.2750	71.3005	71.1056	70.1311	70.1311	69.9362	70.5209	71.1056	71.4954	71.8852	(39)

Average = Sum(39)m / 12 = 71.2518

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9224	0.9199	0.9174	0.9051	0.9026	0.8902	0.8902	0.8877	0.8952	0.9026	0.9075	0.9125	(40)
HLP (average)												0.9044	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4393 (42)

Hot water usage for mixer showers

65.1188	64.1402	62.7142	59.9857	57.9722	55.7268	54.4504	55.8657	57.4170	59.8280	62.6150	64.8693	(42a)

Hot water usage for baths

28.1265	27.7087	27.1205	26.0359	25.2238	24.3232	23.8368	24.4209	25.0569	26.0205	27.1275	28.0314	(42b)

Hot water usage for other uses

39.6109	38.1705	36.7301	35.2897	33.8493	32.4089	32.4089	33.8493	35.2897	36.7301	38.1705	39.6109	(42c)

Average daily hot water use (litres/day) 122.1250 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.8562	130.0195	126.5648	121.3114	117.0453	112.4589	110.6962	114.1360	117.7637	122.5786	127.9130	132.5116	(44)
Energy conte	210.4117	185.1460	194.5254	166.0692	157.5655	138.2814	133.8775	141.3241	145.2144	166.3381	182.2355	207.4812	(45)

Energy content (annual) Total = Sum(45)m = 2028.4701

Distribution loss (46)m = 0.15 x (45)m

31.5618	27.7719	29.1788	24.9104	23.6348	20.7422	20.0816	21.1986	21.7822	24.9507	27.3353	31.1222	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)

Total per year (kWh/year) = Sum(64)m = 2373.3951 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	69.9619	61.5610	64.6797	55.2180	52.3905	45.9786	44.5143	46.9903	48.2838	55.3074	60.5933	68.9875	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.4359	22.5919	18.3730	13.9095	10.3975	8.7780	9.4850	12.3289	16.5479	21.0113	24.5233	26.1428	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	323.6893	327.0482	318.5839	300.5645	277.8182	256.4399	242.1578	238.7990	247.2632	265.2827	288.0290	309.4073	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	(71)
Water heating gains (Table 5)													
	94.0348	91.6087	86.9351	76.6917	70.4174	63.8591	59.8310	63.1590	67.0608	74.3379	84.1574	92.7251	(72)
Total internal gains													
	544.0213	542.1101	524.7533	492.0270	459.4944	429.9383	412.3351	415.1481	431.7332	461.4932	497.5709	529.1365	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.3400	46.7521	0.3300	0.0000	0.7700	87.1970	(78)
East	11.4100	19.6403	0.3100	0.0000	0.7700	53.4916	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	140.6886	247.4471	354.2384	456.9285	522.2609	521.4907	501.6391	453.4942	390.4515	278.1951	170.0559	119.3351	(83)
Total gains	684.7099	789.5572	878.9916	948.9555	981.7553	951.4290	913.9742	868.6423	822.1847	739.6883	667.6268	648.4716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.3836	64.5568	64.7309	65.6156	65.7954	66.7097	66.7097	66.8956	66.3410	65.7954	65.4367	65.0819	
alpha	5.2922	5.3038	5.3154	5.3744	5.3864	5.4473	5.4473	5.4597	5.4227	5.3864	5.3624	5.3388	
util living area													
	0.9783	0.9555	0.9056	0.8004	0.6451	0.4676	0.3370	0.3693	0.5773	0.8433	0.9578	0.9829	(86)
MIT	20.1236	20.3348	20.5933	20.8330	20.9548	20.9935	20.9991	20.9985	20.9806	20.8127	20.4269	20.0787	(87)
Th 2	20.1485	20.1506	20.1527	20.1632	20.1653	20.1758	20.1758	20.1779	20.1716	20.1653	20.1611	20.1569	(88)
util rest of house													
	0.9731	0.9455	0.8860	0.7653	0.5953	0.4091	0.2742	0.3039	0.5134	0.8060	0.9465	0.9787	(89)
MIT 2	19.1445	19.4082	19.7221	20.0036	20.1290	20.1720	20.1755	20.1774	20.1590	19.9908	19.5346	19.0947	(90)
Living area fraction									fLA = Living area / (4) =			0.3474	(91)
MIT	19.4847	19.7301	20.0248	20.2917	20.4159	20.4574	20.4616	20.4627	20.4444	20.2764	19.8446	19.4365	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4847	19.7301	20.0248	20.2917	20.4159	20.4574	20.4616	20.4627	20.4444	20.2764	19.8446	19.4365	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9680	0.9397	0.8828	0.7710	0.6106	0.4292	0.2960	0.3266	0.5348	0.8114	0.9415	0.9742	(94)
Useful gains	662.8265	741.9116	775.9375	731.6102	599.4984	408.3721	270.5679	283.6980	439.7368	600.1526	628.5582	631.7551	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1103.3905	1074.7367	977.5038	812.2363	619.7492	410.7884	270.8207	284.1266	447.4160	688.0433	911.1798	1095.2815	(97)
Space heating kWh													
	327.7796	223.6585	149.9654	58.0508	15.0666	0.0000	0.0000	0.0000	0.0000	65.3907	203.4875	344.8637	(98a)
Space heating requirement - total per year (kWh/year)												1388.2627	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	327.7796	223.6585	149.9654	58.0508	15.0666	0.0000	0.0000	0.0000	0.0000	65.3907	203.4875	344.8637	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1388.2627	
Space heating per m2											(98c) / (4) =	17.6220	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	327.7796	223.6585	149.9654	58.0508	15.0666	0.0000	0.0000	0.0000	0.0000	65.3907	203.4875	344.8637	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	327.7796	223.6585	149.9654	58.0508	15.0666	0.0000	0.0000	0.0000	0.0000	65.3907	203.4875	344.8637	(211)
Space heating efficiency (main heating system 2)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2											0.0000	(213)
Water heating												
Water heating requirement												
	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762 (64)
Efficiency of water heater												361.6650 (216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)
Fuel for water heating, kWh/month												
	66.2787	58.5088	61.8861	53.7567	51.6667	46.0734	45.1170	47.1760	47.9904	54.0923	58.2267	65.4684 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	11.5097	10.3959	11.5097	11.1384	11.5097	11.1384	11.5097	11.5097	11.1384	11.5097	11.1384	11.5097 (231)
Lighting	22.2639	17.8609	16.0818	11.7822	9.1009	7.4355	8.3022	10.7915	14.0170	18.3911	20.7727	22.8827 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1388.2627	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	656.2413	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	135.5174	(230a)
Total electricity for the above, kWh/year	135.5174	(231)
Electricity for lighting (calculated in Appendix L)	179.6823	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2359.7037	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1388.2627	16.4900	228.9245	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	656.2413	16.4900	108.2142	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	135.5174	16.4900	22.3468	(249)
Energy for lighting	179.6823	16.4900	29.6296	(250)
Additional standing charges			0.0000	(251)
Total energy cost			389.1151	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1317	(257)
SAP value		81.6552	
SAP rating (Section 12)		82	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1388.2627	0.1572	218.2807	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	656.2413	0.1412	92.6361	(264)
Space and water heating			310.9168	(265)
Pumps, fans and electric keep-hot	135.5174	0.1387	18.7979	(267)
Energy for lighting	179.6823	0.1443	25.9337	(268)
Total CO2, kg/year			355.6485	(272)
CO2 emissions per m2			4.5100	(273)
EI value			96.1499	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.7800	(1b)	x 2.4000	(2b) =	189.0720	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.7800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.0720	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9400	(17)
Infiltration rate		0.1470	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1249	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1343	0.1281	0.1281	0.1187	0.1218	0.1062	0.1062	0.1031	0.1062	0.1187	0.1156	0.1249	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2703	0.2641	0.2641	0.2547	0.2578	0.2422	0.2422	0.2391	0.2422	0.2547	0.2516	0.2610	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Window			7.3400	1.1450	8.4046			(27)
Window-Red			11.4100	1.2357	14.0998			(27)
Terrace Floor			5.7100	0.1400	0.7994	0.0000	0.0000	(28b)
Brickwork	56.2700	18.7500	37.5200	0.2100	7.8792	110.0000	4127.2001	(29a)
Communal Wall	6.6000	2.0600	4.5400	0.2200	0.9988	110.0000	499.4000	(29a)
Stairwell Wall	14.3400		14.3400	0.1600	2.2944	110.0000	1577.4000	(29a)
Plane Roof	78.7800		78.7800	0.0900	7.0902	9.0000	709.0200	(30)
Total net area of external elements Aum(A, m2)			161.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.0384			(33)
Main dwelling								
Party Wall 1			30.9300	0.0000	0.0000	110.0000	3402.3000	(32)
Party Floor 1			73.0700			70.0000	5114.9000	(32d)
Internal Wall 1			156.9000			9.0000	1412.0999	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16842.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7893 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	17.3700	0.0380	0.6601
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.2500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.0000	0.3300	1.3200
E16 Corner (normal)	8.2500	0.0540	0.4455
P4 Party wall - Roof (insulation at ceiling level)	11.2500	0.1010	1.1362
E10 Eaves (insulation at ceiling level)	18.1600	0.0630	1.1441
E20 Exposed floor (normal)	6.7700	0.1200	0.8124
E12 Gable (insulation at ceiling level)	11.5500	0.0980	1.1319
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0970	-0.5335
E25 Staggered party wall between dwellings	5.5000	0.0310	0.1705
E2 Other lintels (including other steel lintels)	9.8400	0.0500	0.4920
E4 Jamb	29.2900	0.0160	0.4686
E5 Ground floor (normal)	24.5000	0.1120	2.7440

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.2008 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 54.2392 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.8664	16.4766	16.4766	15.8918	16.0867	15.1122	15.1122	14.9173	15.1122	15.8918	15.6969	16.2817	(38)
Heat transfer coeff	71.1056	70.7158	70.7158	70.1311	70.3260	69.3515	69.3515	69.1566	69.3515	70.1311	69.9362	70.5209	(39)
Average = Sum(39)m / 12 =												70.0661	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9026	0.8976	0.8976	0.8902	0.8927	0.8803	0.8803	0.8778	0.8803	0.8902	0.8877	0.8952	(40)
HLP (average)												0.8894	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4393	(42)
Hot water usage for mixer showers													
	65.1188	64.1402	62.7142	59.9857	57.9722	55.7268	54.4504	55.8657	57.4170	59.8280	62.6150	64.8693	(42a)
Hot water usage for baths													
	28.1265	27.7087	27.1205	26.0359	25.2238	24.3232	23.8368	24.4209	25.0569	26.0205	27.1275	28.0314	(42b)
Hot water usage for other uses													
	39.6109	38.1705	36.7301	35.2897	33.8493	32.4089	32.4089	33.8493	35.2897	36.7301	38.1705	39.6109	(42c)
Average daily hot water use (litres/day)												122.1250	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	132.8562	130.0195	126.5648	121.3114	117.0453	112.4589	110.6962	114.1360	117.7637	122.5786	127.9130	132.5116	(44)
Energy conte	210.4117	185.1460	194.5254	166.0692	157.5655	138.2814	133.8775	141.3241	145.2144	166.3381	182.2355	207.4812	(45)
Energy content (annual)										Total = Sum(45)m =		2028.4701	
Distribution loss (46)m = 0.15 x (45)m													
	31.5618	27.7719	29.1788	24.9104	23.6348	20.7422	20.0816	21.1986	21.7822	24.9507	27.3353	31.1222	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)
										Total per year (kWh/year) = Sum(64)m =		2373.3951	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	69.9619	61.5610	64.6797	55.2180	52.3905	45.9786	44.5143	46.9903	48.2838	55.3074	60.5933	68.9875	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	146.3583	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	25.4359	22.5919	18.3730	13.9095	10.3975	8.7780	9.4850	12.3289	16.5479	21.0113	24.5233	26.1428	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	323.6893	327.0482	318.5839	300.5645	277.8182	256.4399	242.1578	238.7990	247.2632	265.2827	288.0290	309.4073	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	52.0751	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	-97.5722	(71)
Water heating gains (Table 5)													
	94.0348	91.6087	86.9351	76.6917	70.4174	63.8591	59.8310	63.1590	67.0608	74.3379	84.1574	92.7251	(72)
Total internal gains													
	544.0213	542.1101	524.7533	492.0270	459.4944	429.9383	412.3351	415.1481	431.7332	461.4932	497.5709	529.1365	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.3400	54.2217	0.3300	0.0000	0.7700	101.1286	(78)
East	11.4100	23.8018	0.3100	0.0000	0.7700	64.8257	(76)

Solar gains	165.9543	255.0790	362.9755	476.8810	532.9230	563.8927	536.6552	495.9022	426.9514	307.8836	197.6026	141.5893	(83)
Total gains	709.9756	797.1890	887.7287	968.9079	992.4173	993.8309	948.9903	911.0503	858.6846	769.3767	695.1735	670.7258	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.7954	66.1581	66.1581	66.7097	66.5248	67.4596	67.4596	67.6497	67.4596	66.7097	66.8956	66.3410	
alpha	5.3864	5.4105	5.4105	5.4473	5.4350	5.4973	5.4973	5.5100	5.4973	5.4473	5.4597	5.4227	
util living area													
	0.9680	0.9413	0.8757	0.7400	0.5617	0.3620	0.2411	0.2580	0.4799	0.7783	0.9340	0.9743	(86)
MIT	20.2822	20.4626	20.7012	20.9003	20.9802	20.9986	20.9999	20.9998	20.9934	20.8905	20.5778	20.2414	(87)
Th 2	20.1653	20.1695	20.1695	20.1758	20.1737	20.1843	20.1843	20.1864	20.1843	20.1758	20.1779	20.1716	(88)
util rest of house													
	0.9603	0.9283	0.8511	0.6992	0.5085	0.3056	0.1815	0.1963	0.4167	0.7317	0.9170	0.9679	(89)
MIT 2	19.3563	19.5805	19.8629	20.0858	20.1594	20.1836	20.1842	20.1863	20.1806	20.0811	19.7315	19.3109	(90)
Living area fraction										fLA = Living area / (4) =		0.3474	(91)
MIT	19.6780	19.8870	20.1541	20.3687	20.4446	20.4667	20.4676	20.4690	20.4630	20.3623	20.0255	19.6341	(92)

Temperature adjustment												0.0000	
adjusted MIT	19.6780	19.8870	20.1541	20.3687	20.4446	20.4667	20.4676	20.4690	20.4630	20.3623	20.0255	19.6341	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9232	0.8506	0.7091	0.5262	0.3252	0.2022	0.2177	0.4385	0.7429	0.9134	0.9629	(94)
Useful gains	677.9907	735.9683	755.1199	687.0583	522.2179	323.1878	191.9146	198.3728	376.4991	571.5511	634.9601	645.8399	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1036.5761	1003.2428	901.9180	734.1845	530.5803	323.6457	191.9380	198.4077	378.8672	621.5249	841.0183	1024.9606	(97)
Space heating kWh	266.7875	179.6085	109.2178	33.9309	6.2216	0.0000	0.0000	0.0000	0.0000	37.1805	148.3619	282.0658	(98a)
Space heating requirement - total per year (kWh/year)												1063.3745	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	266.7875	179.6085	109.2178	33.9309	6.2216	0.0000	0.0000	0.0000	0.0000	37.1805	148.3619	282.0658	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1063.3745	
Space heating per m2											(98c) / (4) =	13.4980	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	266.7875	179.6085	109.2178	33.9309	6.2216	0.0000	0.0000	0.0000	0.0000	37.1805	148.3619	282.0658	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	266.7875	179.6085	109.2178	33.9309	6.2216	0.0000	0.0000	0.0000	0.0000	37.1805	148.3619	282.0658	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	239.7067	211.6060	223.8204	194.4192	186.8605	166.6314	163.1725	170.6191	173.5644	195.6331	210.5855	236.7762	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	66.2787	58.5088	61.8861	53.7567	51.6667	46.0734	45.1170	47.1760	47.9904	54.0923	58.2267	65.4684	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.5097	10.3959	11.5097	11.1384	11.5097	11.1384	11.5097	11.5097	11.1384	11.5097	11.1384	11.5097	(231)
Lighting	22.2639	17.8609	16.0818	11.7822	9.1009	7.4355	8.3022	10.7915	14.0170	18.3911	20.7727	22.8827	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1063.3745	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												656.2413	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												135.5174	(230a)
Total electricity for the above, kWh/year												135.5174	(231)
Electricity for lighting (calculated in Appendix L)												179.6823	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2034.8155	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating - main system 1	1063.3745	27.6700	294.2357	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	656.2413	27.6700	181.5820	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	135.5174	27.6700	37.4977	(249)
Energy for lighting	179.6823	27.6700	49.7181	(250)
Additional standing charges			0.0000	(251)
Total energy cost			563.0335	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1063.3745	0.1580	168.0433	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	656.2413	0.1412	92.6361	(264)
Space and water heating			260.6794	(265)
Pumps, fans and electric keep-hot	135.5174	0.1387	18.7979	(267)
Energy for lighting	179.6823	0.1443	25.9337	(268)
Total CO2, kg/year			305.4111	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1063.3745	1.5850	1685.4301	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	656.2413	1.5220	998.7845	(278)
Space and water heating			2684.2147	(279)
Pumps, fans and electric keep-hot	135.5174	1.5128	205.0107	(281)
Energy for lighting	179.6823	1.5338	275.6028	(282)
Total Primary energy kWh/year			3164.8281	(286)

Summary for Input Data

Plot Reference	P-31	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-31
Plot Address	Flat 11, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.00	**TER**	14.89
Environmental	97 A	**% DER < TER**			66.42
CO_2 Emissions (t/year)	0.21	**DFEE**	34.79	**TFEE**	35.86
Compliance Check	See BREL	**% DFEE < TFEE**			2.98
% DPER < TPER	34.68	**DPER**	51.81	**TPER**	79.31

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	237.54	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	16.77 m	51.65 m²	2.40 m

8.0 Living Area	25.47	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	40.53	29.66	0.00	None	10.87	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.49	4.43	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	32.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	98.90

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	51.65	51.65	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	51.65

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	East	2.06	
Patio Door	Patio Door	Brickwork	West	5.42	
West	Window	Brickwork	West	2.72	
South	Window	Brickwork	South	2.72	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	12.47	0.04	0.04	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	5.50	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	11.73	0.00	0.00		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.30	0.33	0.33	Abbey Calculated	No
E2 Other lintels (including other steel lintels)	Independently assessed	5.55	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.49	0.02	0.02	RCD	No
E16 Corner (normal)	Gov Approved Scheme	5.50	0.05	0.05	RCD	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	11.73	0.10	0.10	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	6.82	0.06	0.06		No
E12 Gable (insulation at ceiling level)	Independently assessed	9.93	0.10	0.10	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.85	-0.10	-0.10	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	24.50	0.11	0.11	RCD	Yes
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.85	0.03	0.03	RCD	No

Y-value	0.08	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500841
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0

Summary for Input Data

Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.84	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	361.66	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	108953	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	361.66	
Model Name	UPHWHP-200	
Manufacturer	Vanward	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

Summary for Input Data

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.75	kWh/day

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-31	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-31
Plot Address	Flat 11, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.00	**TER**	14.89
Environmental	97 A	**% DER < TER**			66.42
CO_2 Emissions (t/year)	0.21	**DFEE**	34.79	**TFEE**	35.86
Compliance Check	See BREL	**% DFEE < TFEE**			2.98
% DPER < TPER	34.68	**DPER**	51.81	**TPER**	79.31

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.4000	(2b) =	123.9600	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		123.9600	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.1420	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2899	0.2869	0.2839	0.2688	0.2658	0.2507	0.2507	0.2476	0.2567	0.2658	0.2718	0.2778	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	40.5300	10.8600	29.6700	0.2100	6.2307	110.0000	3263.6999	(29a)
Communal Wall	6.4900	2.0600	4.4300	0.2200	0.9746	110.0000	487.3000	(29a)
Cold Roof	51.6500		51.6500	0.0900	4.6485	9.0000	464.8500	(30)
Total net area of external elements Aum(A, m2)			98.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7609			(33)
Main dwelling								
Party Wall 1			32.2500	0.0000	0.0000	110.0000	3547.5000	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Internal Wall 1			98.9000			9.0000	890.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12268.9499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		237.5402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.4700	0.0380	0.4739
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.7300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	5.5000	0.0540	0.2970
P4 Party wall - Roof (insulation at ceiling level)	11.7300	0.1010	1.1847
E10 Eaves (insulation at ceiling level)	6.8200	0.0630	0.4297
E12 Gable (insulation at ceiling level)	9.9300	0.0980	0.9731
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1156 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 34.8765 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.8586	11.7351	11.6117	10.9945	10.8711	10.2539	10.2539	10.1305	10.5008	10.8711	11.1180	11.3648	(38)
Heat transfer coeff	46.7351	46.6117	46.4882	45.8711	45.7476	45.1304	45.1304	45.0070	45.3773	45.7476	45.9945	46.2414	(39)

Average = Sum(39)m / 12 = 45.8402

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9048	0.9025	0.9001	0.8881	0.8857	0.8738	0.8738	0.8714	0.8786	0.8857	0.8905	0.8953	(40)
HLP (average)												0.8875	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)

Energy content (annual) Total = Sum(45)m = 1662.4694

Distribution loss (46)m = 0.15 x (45)m

25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)

Total per year (kWh/year) = Sum(64)m = 2007.3944 (64)

12Total per year (kWh/year) 2007 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains	354.2931	362.0874	346.0852	331.8094	313.4656	300.6378	288.0966	289.2516	298.9655	310.8102	332.0596	346.5342	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

West				5.4200		19.6403		0.3300		0.0000		0.7700	27.0490 (80)
South				2.7200		46.7521		0.3300		0.0000		0.7700	32.3128 (78)
West				2.7200		19.6403		0.3300		0.0000		0.7700	13.5744 (80)
Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279 (83)	
Total gains	427.2292	494.4754	544.3684	598.8678	626.7770	616.4998	590.7218	557.5747	521.5941	462.1848	421.0139	407.8622 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.9225	73.1156	73.3097	74.2961	74.4966	75.5154	75.5154	75.7225	75.1045	74.4966	74.0967	73.7011	
alpha	5.8615	5.8744	5.8873	5.9531	5.9664	6.0344	6.0344	6.0482	6.0070	5.9664	5.9398	5.9134	
util living area	0.9865	0.9688	0.9290	0.8217	0.6556	0.4659	0.3358	0.3707	0.5888	0.8686	0.9698	0.9894	(86)
MIT	20.1866	20.3848	20.6182	20.8569	20.9670	20.9964	20.9996	20.9993	20.9863	20.8309	20.4750	20.1524	(87)
Th 2	20.1634	20.1654	20.1674	20.1776	20.1797	20.1898	20.1898	20.1919	20.1858	20.1797	20.1756	20.1715	(88)
util rest of house	0.9829	0.9608	0.9120	0.7868	0.6050	0.4081	0.2742	0.3059	0.5239	0.8327	0.9606	0.9864	(89)
MIT 2	19.2287	19.4776	19.7632	20.0430	20.1541	20.1879	20.1897	20.1916	20.1773	20.0239	19.6012	19.1920	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.7010	19.9249	20.1848	20.4443	20.5550	20.5866	20.5891	20.5899	20.5763	20.4218	20.0321	19.6656	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7010	19.9249	20.1848	20.4443	20.5550	20.5866	20.5891	20.5899	20.5763	20.4218	20.0321	19.6656	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9581	0.9124	0.7986	0.6286	0.4365	0.3046	0.3379	0.5554	0.8441	0.9587	0.9842	(94)
Useful gains	418.8322	473.7719	496.6843	478.2852	393.9639	269.1279	179.9326	188.3970	289.7135	390.1276	403.6400	401.3980	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	719.7692	700.3381	636.1829	529.5516	405.0930	270.1762	180.0289	188.5744	293.8759	449.3257	594.8059	715.1526	(97)
Space heating kWh	223.8971	152.2525	103.7869	36.9118	8.2801	0.0000	0.0000	0.0000	0.0000	44.0434	137.6394	233.4334	(98a)
Space heating requirement - total per year (kWh/year)												940.2447	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.8971	152.2525	103.7869	36.9118	8.2801	0.0000	0.0000	0.0000	0.0000	44.0434	137.6394	233.4334	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												940.2447	
Space heating per m2											(98c) / (4) =	18.2042	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	223.8971	152.2525	103.7869	36.9118	8.2801	0.0000	0.0000	0.0000	0.0000	44.0434	137.6394	233.4334	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	223.8971	152.2525	103.7869	36.9118	8.2801	0.0000	0.0000	0.0000	0.0000	44.0434	137.6394	233.4334	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.5460	6.8158	7.5460	7.3026	7.5460	7.3026	7.5460	7.5460	7.3026	7.5460	7.3026	7.5460	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												940.2447	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	88.8483	(230a)
Total electricity for the above, kWh/year	88.8483	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1720.3727	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	940.2447	0.1573	147.9295	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			226.2380	(265)
Pumps, fans and electric keep-hot	88.8483	0.1387	12.3244	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			258.2256	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	940.2447	1.5824	1487.8576	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)
Space and water heating			2332.4618	(279)
Pumps, fans and electric keep-hot	88.8483	1.5128	134.4098	(281)
Energy for lighting	136.2372	1.5338	208.9651	(282)
Total Primary energy kWh/year			2675.8367	(286)
Dwelling Primary energy Rate (DPER)			51.8100	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.4000	(2b) =	123.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	123.9600	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1613	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4113	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3496	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)

Adj infilt rate												
	0.4458	0.4371	0.4283	0.3846	0.3759	0.3322	0.3322	0.3234	0.3496	0.3759	0.3933	0.4108 (22b)
Effective ac	0.5994	0.5955	0.5917	0.5740	0.5706	0.5552	0.5552	0.5523	0.5611	0.5706	0.5774	0.5844 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8600	1.1450	12.4351			(27)
Brickwork	40.5300	10.8600	29.6700	0.1800	5.3406			(29a)
Communal Wall	6.4900	2.0600	4.4300	0.1800	0.7974			(29a)
Cold Roof	51.6500		51.6500	0.1100	5.6815			(30)
Total net area of external elements Aum(A, m2)			98.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.3146			(33)
Main dwelling								
Party Wall 1			32.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 237.5402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.4700	0.0700	0.8729
E18 Party wall between dwellings	5.5000	0.0600	0.3300
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.7300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0500	0.9245
E16 Corner (normal)	5.5000	0.0900	0.4950
P4 Party wall - Roof (insulation at ceiling level)	11.7300	0.1200	1.4076
E10 Eaves (insulation at ceiling level)	6.8200	0.0600	0.4092
E12 Gable (insulation at ceiling level)	9.9300	0.0600	0.5958
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2330 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 35.5476 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5181	24.3603	24.2056	23.4789	23.3429	22.7100	22.7100	22.5928	22.9538	23.3429	23.6180	23.9055	(38)
Heat transfer coeff	60.0657	59.9079	59.7532	59.0265	58.8905	58.2576	58.2576	58.1404	58.5014	58.8905	59.1656	59.4531	(39)
Average = Sum(39)m / 12 =												59.0259	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1629	1.1599	1.1569	1.1428	1.1402	1.1279	1.1279	1.1257	1.1327	1.1402	1.1455	1.1511	(40)
HLP (average)												1.1428	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy											1.7387	(42)
Hot water usage for mixer showers												
	53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680 (42a)
Hot water usage for baths												
	23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972 (42b)
Hot water usage for other uses												
	32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365 (42c)
Average daily hot water use (litres/day)												100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m													
	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	219.0409	193.8256	206.0225	181.1975	175.7315	158.4238	156.3170	162.4195	164.1044	182.9195	194.4456	216.6389	(62)
WWHRS	-24.3997	-21.5793	-22.5966	-18.7109	-17.4379	-14.9217	-13.9867	-14.8735	-15.4386	-18.2004	-20.6188	-23.9478	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
										Total per year (kWh/year) = Sum(64)m =		1984.3750	(64)
12Total per year (kWh/year)												1984	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	94.6142	84.1221	90.2856	81.3286	80.2138	73.7564	73.7585	75.7876	75.6451	82.6039	85.7336	93.8156	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	127.1696	125.1817	121.3516	112.9564	107.8143	102.4394	99.1378	101.8651	105.0627	111.0267	119.0744	126.0962	(72)
Total internal gains													
	407.3951	415.1894	399.1873	384.9114	366.5676	350.7398	338.1986	339.3536	349.0676	363.9122	385.1616	399.6363	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.7200	46.7521	0.6300	0.7000	0.7700	38.8635	(78)
West	8.1400	19.6403	0.6300	0.7000	0.7700	48.8589	(80)

Solar gains	87.7223	159.2267	238.4806	321.1985	376.8282	379.8959	363.9756	322.7195	267.7615	182.0625	106.9877	73.7608	(83)
Total gains	495.1174	574.4161	637.6679	706.1099	743.3958	730.6357	702.1742	662.0732	616.8290	545.9747	492.1494	473.3971	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.7385	56.8880	57.0353	57.7375	57.8708	58.4995	58.4995	58.6174	58.2557	57.8708	57.6018	57.3232	
alpha	4.7826	4.7925	4.8024	4.8492	4.8581	4.9000	4.9000	4.9078	4.8837	4.8581	4.8401	4.8215	
util living area													
	0.9824	0.9645	0.9271	0.8337	0.6840	0.5009	0.3634	0.4011	0.6233	0.8732	0.9648	0.9854	(86)
MIT	19.8864	20.1148	20.4061	20.7285	20.9151	20.9851	20.9975	20.9959	20.9584	20.7062	20.2484	19.8501	(87)
Th 2	19.9498	19.9522	19.9546	19.9660	19.9682	19.9781	19.9781	19.9799	19.9743	19.9682	19.9638	19.9593	(88)
util rest of house													
	0.9774	0.9549	0.9081	0.7952	0.6234	0.4249	0.2799	0.3136	0.5425	0.8336	0.9535	0.9812	(89)
MIT 2	18.6884	18.9747	19.3319	19.7115	19.9030	19.9702	19.9773	19.9786	19.9491	19.6999	19.1541	18.6498	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.2791	19.5369	19.8616	20.2130	20.4021	20.4706	20.4804	20.4803	20.4468	20.1961	19.6937	19.2417	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2791	19.5369	19.8616	20.2130	20.4021	20.4706	20.4804	20.4803	20.4468	20.1961	19.6937	19.2417	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9733	0.9503	0.9061	0.8051	0.6497	0.4620	0.3211	0.3568	0.5808	0.8433	0.9500	0.9775	(94)
Useful gains	481.9055	545.8592	577.8093	568.4847	483.0086	337.5478	225.4669	236.2375	358.2505	460.4009	467.5200	462.7602	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	899.7333	876.8656	798.4001	667.7660	512.4689	342.0094	226.0615	237.2281	371.2997	565.1225	745.1149	894.2788	(97)
Space heating kWh													
	310.8639	222.4363	164.1196	71.4825	21.9184	0.0000	0.0000	0.0000	0.0000	77.9128	199.8683	321.0499	(98a)
Space heating requirement - total per year (kWh/year)												1389.6516	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	310.8639	222.4363	164.1196	71.4825	21.9184	0.0000	0.0000	0.0000	0.0000	77.9128	199.8683	321.0499	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1389.6516	
Space heating per m2											(98c) / (4) =	26.9052	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	310.8639	222.4363	164.1196	71.4825	21.9184	0.0000	0.0000	0.0000	0.0000	77.9128	199.8683	321.0499	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	336.7973	240.9927	177.8110	77.4458	23.7469	0.0000	0.0000	0.0000	0.0000	84.4126	216.5420	347.8330	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1043	84.6343	83.8113	82.3500	80.7960	79.8000	79.8000	79.8000	79.8000	82.4845	84.3736	85.1961	(217)
Fuel for water heating, kWh/month													
	228.7090	203.5183	218.8560	197.3123	195.9177	179.8273	178.3588	184.8948	186.2980	199.6971	206.0202	226.1737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9214	12.7728	11.5005	8.4257	6.5083	5.3173	5.9371	7.7172	10.0239	13.1519	14.8551	16.3640	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-13.9766	-20.7826	-31.4959	-37.4135	-42.1278	-39.9999	-39.5329	-36.4411	-31.2895	-24.6504	-15.7505	-11.9625 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.9299	-10.6083	-21.5278	-32.9858	-44.2484	-44.6716	-44.1257	-37.0541	-26.7727	-15.3613	-6.6443	-3.8795 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1505.5814	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2405.5832	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.4952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-638.2327	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3487.4271	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1505.5814	0.2100	316.1721	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2405.5832	0.2100	505.1725	(264)
Space and water heating			821.3446	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.4952	0.1443	18.5458	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	0.1335	-46.1008	
PV Unit electricity exported	-292.8094	0.1253	-36.6969	
Total			-82.7977	(269)
Total CO2, kg/year			769.0220	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1505.5814	1.1300	1701.3070	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2405.5832	1.1300	2718.3090	(278)
Space and water heating			4419.6160	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.4952	1.5338	197.0902	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	1.4932	-515.7819	
PV Unit electricity exported	-292.8094	0.4600	-134.6951	
Total			-650.4770	(283)
Total Primary energy kWh/year			4096.3300	(286)
Target Primary Energy Rate (TPER)			79.3100	(287)

Full SAP Calculation Printout

Plot Reference	P-31	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-31
Plot Address	Flat 11, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.00	**TER**	14.89
Environmental	97 A	**% DER < TER**			66.42
CO_2 Emissions (t/year)	0.21	**DFEE**	34.79	**TFEE**	35.86
Compliance Check	See BREL	**% DFEE < TFEE**			2.98
% DPER < TPER	34.68	**DPER**	51.81	**TPER**	79.31

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500 (1b)	x	2.4000 (2b)	=	123.9600	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	123.9600	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1613	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.3033	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2578	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3287	0.3223	0.3159	0.2836	0.2772	0.2449	0.2449	0.2385	0.2578	0.2772	0.2901	0.3030	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5540	0.5519	0.5499	0.5402	0.5384	0.5300	0.5300	0.5284	0.5332	0.5384	0.5421	0.5459	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	40.5300	10.8600	29.6700	0.2100	6.2307	110.0000	3263.6999	(29a)
Communal Wall	6.4900	2.0600	4.4300	0.2200	0.9746	110.0000	487.3000	(29a)
Cold Roof	51.6500		51.6500	0.0900	4.6485	9.0000	464.8500	(30)
Total net area of external elements Aum(A, m2)			98.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7609			(33)
Main dwelling								
Party Wall 1			32.2500	0.0000	0.0000	110.0000	3547.5000	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Internal Wall 1			98.9000			9.0000	890.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12268.9499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		237.5402 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	12.4700	0.0380	0.4739

E18 Party wall between dwellings	5.5000	0.0380	0.2090	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.7300	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190	
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775	
E4 Jamb	18.4900	0.0160	0.2958	
E16 Corner (normal)	5.5000	0.0540	0.2970	
P4 Party wall - Roof (insulation at ceiling level)	11.7300	0.1010	1.1847	
E10 Eaves (insulation at ceiling level)	6.8200	0.0630	0.4297	
E12 Gable (insulation at ceiling level)	9.9300	0.0980	0.9731	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765	
E5 Ground floor (normal)	24.5000	0.1120	2.7440	
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1156 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 34.8765 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.6639	22.5781	22.4939	22.0987	22.0248	21.6806	21.6806	21.6169	21.8132	22.0248	22.1744	22.3308	(38)
Heat transfer coeff	57.5404	57.4546	57.3705	56.9753	56.9013	56.5571	56.5571	56.4934	56.6897	56.9013	57.0509	57.2073	(39)

Average = Sum(39)m / 12 = 56.9749

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1140	1.1124	1.1108	1.1031	1.1017	1.0950	1.0950	1.0938	1.0976	1.1017	1.1046	1.1076	(40)
HLP (average)												1.1031	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 50.8820 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5117	53.9894	52.3273	50.2580	48.4122	46.4939	46.0949	47.7536	49.4549	51.4249	53.5126	55.4336	(44)
Energy conte	87.9169	76.8803	80.4252	68.8007	65.1722	57.1697	55.7477	59.1289	60.9828	69.7831	76.2385	86.7957	(45)

Energy content (annual) Total = Sum(45)m = 845.0417

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(64)

Total per year (kWh/year) = Sum(64)m = 718.2855 (64)

12Total per year (kWh/year) 718 (64)

Electric shower(s)

42.7425	38.0839	41.5862	39.6852	40.4299	38.5662	39.8517	40.4299	39.6852	41.5862	40.8042	42.7425	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 486.1935 (64a)

Heat gains from water heating, kWh/month

29.3680	25.8580	27.4869	24.5415	23.9566	21.7901	21.8093	22.6724	22.8801	25.2255	26.4017	29.1297	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	39.4731	38.4792	36.9448	34.0854	32.1997	30.2640	29.3136	30.4736	31.7780	33.9052	36.6691	39.1528	(72)
Total internal gains	316.6985	325.4869	311.7804	303.0404	287.9530	278.5645	268.3745	267.9622	275.7829	283.7907	299.7563	309.6929	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
West	2.7200	19.6403	0.3300	0.0000	0.7700	13.5744	(80)

Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	389.6347	457.8750	510.0636	570.0988	601.2644	594.4265	570.9997	536.2853	498.4114	435.1654	388.7105	371.0209	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.2286	59.3171	59.4041	59.8161	59.8939	60.2584	60.2584	60.3264	60.1174	59.8939	59.7368	59.5735	
alpha	4.9486	4.9545	4.9603	4.9877	4.9929	5.0172	5.0172	5.0218	5.0078	4.9929	4.9825	4.9716	
util living area	0.9931	0.9843	0.9639	0.9013	0.7758	0.5881	0.4320	0.4779	0.7194	0.9322	0.9852	0.9946	(86)
MIT	19.7514	19.9678	20.2594	20.6172	20.8633	20.9730	20.9952	20.9922	20.9288	20.5942	20.1063	19.7104	(87)
Th 2	19.9894	19.9907	19.9921	19.9983	19.9995	20.0049	20.0049	20.0059	20.0028	19.9995	19.9971	19.9946	(88)
util rest of house	0.9911	0.9796	0.9530	0.8730	0.7195	0.5052	0.3363	0.3780	0.6384	0.9062	0.9799	0.9929	(89)
MIT 2	18.8655	19.0800	19.3653	19.7048	19.9130	19.9932	20.0037	20.0038	19.9669	19.6931	19.2237	18.8290	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.3024	19.5178	19.8062	20.1548	20.3816	20.4763	20.4927	20.4912	20.4412	20.1375	19.6589	19.2636	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3024	19.5178	19.8062	20.1548	20.3816	20.4763	20.4927	20.4912	20.4412	20.1375	19.6589	19.2636	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9892	0.9769	0.9506	0.8779	0.7422	0.5454	0.3836	0.4274	0.6757	0.9103	0.9777	0.9913	(94)
Useful gains	385.4258	447.2784	484.8823	500.4949	446.2511	324.1758	219.0198	229.1937	336.7880	396.1493	380.0398	367.7984	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	863.2426	839.8599	763.3809	641.2427	493.9943	332.3491	220.1573	231.1258	359.4834	542.6943	716.4997	861.7495	(97)
Space heating kWh	355.4957	263.8147	207.2030	101.3385	35.5209	0.0000	0.0000	0.0000	0.0000	109.0295	242.2511	367.4996	(98a)
Space heating requirement - total per year (kWh/year)												1682.1530	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	355.4957	263.8147	207.2030	101.3385	35.5209	0.0000	0.0000	0.0000	0.0000	109.0295	242.2511	367.4996	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1682.1530	
Space heating per m2										(98c) / (4) =		32.5683	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	531.6372	418.5229	429.3499	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9128	0.9558	0.9397	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	485.2630	400.0294	403.4483	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	667.2663	641.4060	602.2981	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	131.0424	179.5842	147.9442	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.7606	44.8960	36.9861	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												114.6427	(107)
Energy for space heating												32.5683	(99)
Energy for space cooling												2.2196	(108)
Total												34.7879	(109)
Fabric Energy Efficiency (DFEE)												34.8	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		51.6500	(1b)	x 2.4000	(2b) =	123.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		123.9600	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)

Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1613 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.4113 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3496 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4458	0.4371	0.4283	0.3846	0.3759	0.3322	0.3322	0.3234	0.3496	0.3759	0.3933	0.4108	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5994	0.5955	0.5917	0.5740	0.5706	0.5552	0.5552	0.5523	0.5611	0.5706	0.5774	0.5844	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8600	1.1450	12.4351			(27)
Brickwork	40.5300	10.8600	29.6700	0.1800	5.3406			(29a)
Communal Wall	6.4900	2.0600	4.4300	0.1800	0.7974			(29a)
Cold Roof	51.6500		51.6500	0.1100	5.6815			(30)
Total net area of external elements Aum(A, m2)			98.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.3146			(33)
Main dwelling								
Party Wall 1			32.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 237.5402 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.4700	0.0700	0.8729
E18 Party wall between dwellings	5.5000	0.0600	0.3300
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.7300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0500	0.9245
E16 Corner (normal)	5.5000	0.0900	0.4950
P4 Party wall - Roof (insulation at ceiling level)	11.7300	0.1200	1.4076
E10 Eaves (insulation at ceiling level)	6.8200	0.0600	0.4092
E12 Gable (insulation at ceiling level)	9.9300	0.0600	0.5958
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2330 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.5476 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5181	24.3603	24.2056	23.4789	23.3429	22.7100	22.7100	22.5928	22.9538	23.3429	23.6180	23.9055	(38)
Heat transfer coeff	60.0657	59.9079	59.7532	59.0265	58.8905	58.2576	58.2576	58.1404	58.5014	58.8905	59.1656	59.4531	(39)

Average = Sum(39)m / 12 = 59.0259

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1629	1.1599	1.1569	1.1428	1.1402	1.1279	1.1279	1.1257	1.1327	1.1402	1.1455	1.1511	(40)
HLP (average)												1.1428	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 50.8820 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.5117	53.9894	52.3273	50.2580	48.4122	46.4939	46.0949	47.7536	49.4549	51.4249	53.5126	55.4336	(44)
Energy conte	87.9169	76.8803	80.4252	68.8007	65.1722	57.1697	55.7477	59.1289	60.9828	69.7831	76.2385	86.7957	(45)

Energy content (annual) Total = Sum(45)m = 845.0417
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

74.7294	65.3482	68.3614	58.4806	55.3964	48.5943	47.3856	50.2596	51.8354	59.3157	64.8027	73.7763	(64)

Total per year (kWh/year) = Sum(64)m = 718.2855 (64)
12Total per year (kWh/year) 718 (64)

Electric shower(s)

	42.7425	38.0839	41.5862	39.6852	40.4299	38.5662	39.8517	40.4299	39.6852	41.5862	40.8042	42.7425 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												486.1935 (64a)
Heat gains from water heating, kWh/month												
	29.3680	25.8580	27.4869	24.5415	23.9566	21.7901	21.8093	22.6724	22.8801	25.2255	26.4017	29.1297 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	39.4731	38.4792	36.9448	34.0854	32.1997	30.2640	29.3136	30.4736	31.7780	33.9052	36.6691	39.1528	(72)
Total internal gains													
	316.6985	325.4869	311.7804	303.0404	287.9530	278.5645	268.3745	267.9622	275.7829	283.7907	299.7563	309.6929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.7200	46.7521	0.6300	0.7000	0.7700	38.8635	(78)
West	8.1400	19.6403	0.6300	0.7000	0.7700	48.8589	(80)

Solar gains	87.7223	159.2267	238.4806	321.1985	376.8282	379.8959	363.9756	322.7195	267.7615	182.0625	106.9877	73.7608	(83)
Total gains	404.4209	484.7136	550.2610	624.2389	664.7812	658.4604	632.3500	590.6817	543.5443	465.8532	406.7440	383.4537	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.7385	56.8880	57.0353	57.7375	57.8708	58.4995	58.4995	58.6174	58.2557	57.8708	57.6018	57.3232	
alpha	4.7826	4.7925	4.8024	4.8492	4.8581	4.9000	4.9000	4.9078	4.8837	4.8581	4.8401	4.8215	
util living area													
	0.9922	0.9813	0.9556	0.8797	0.7404	0.5506	0.4025	0.4477	0.6886	0.9207	0.9830	0.9939	(86)
MIT	19.7029	19.9457	20.2650	20.6428	20.8800	20.9776	20.9960	20.9934	20.9363	20.6027	20.0862	19.6657	(87)
Th 2	19.9498	19.9522	19.9546	19.9660	19.9682	19.9781	19.9781	19.9799	19.9743	19.9682	19.9638	19.9593	(88)
util rest of house													
	0.9898	0.9757	0.9425	0.8473	0.6810	0.4692	0.3105	0.3510	0.6057	0.8912	0.9770	0.9920	(89)
MIT 2	18.7865	19.0275	19.3390	19.6971	19.8941	19.9686	19.9771	19.9782	19.9430	19.6726	19.1773	18.7571	(90)
Living area fraction									fLA = Living area / (4) =			0.4931	(91)
MIT	19.2384	19.4803	19.7957	20.1635	20.3802	20.4662	20.4796	20.4788	20.4328	20.1312	19.6255	19.2051	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2384	19.4803	19.7957	20.1635	20.3802	20.4662	20.4796	20.4788	20.4328	20.1312	19.6255	19.2051	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9877	0.9726	0.9402	0.8541	0.7058	0.5088	0.3559	0.3987	0.6443	0.8965	0.9745	0.9902	(94)
Useful gains	399.4579	471.4480	517.3656	533.1396	469.2204	334.9978	225.0733	235.5271	350.2082	417.6425	396.3724	379.6967	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	897.2871	873.4746	794.4584	664.8438	511.1835	341.7490	226.0144	237.1448	370.4771	561.2996	741.0798	892.1028	(97)
Space heating kWh													
	370.3849	270.1619	206.1570	94.8270	31.2205	0.0000	0.0000	0.0000	0.0000	106.8809	248.1893	381.2301	(98a)
Space heating requirement - total per year (kWh/year)												1709.0516	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	370.3849	270.1619	206.1570	94.8270	31.2205	0.0000	0.0000	0.0000	0.0000	106.8809	248.1893	381.2301	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1709.0516	
Space heating per m2											(98c) / (4) =	33.0891	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	547.6217	431.1065	441.8672	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9291	0.9646	0.9507	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	508.7856	415.8461	420.0704	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	742.1110	713.1142	665.8783	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	167.9943	221.1675	182.8811	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	41.9986	55.2919	45.7203	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												143.0107	(107)

Energy for space heating	33.0891 (99)
Energy for space cooling	2.7688 (108)
Total	35.8579 (109)
Fabric Energy Efficiency (TFEE)	35.9 (109)

Full SAP Calculation Printout

Plot Reference	P-31	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-31
Plot Address	Flat 11, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.00	**TER**	14.89
Environmental	97 A	**% DER < TER**			66.42
CO_2 Emissions (t/year)	0.21	**DFEE**	34.79	**TFEE**	35.86
Compliance Check	See BREL	**% DFEE < TFEE**			2.98
% DPER < TPER	34.68	**DPER**	51.81	**TPER**	79.31

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.4000	(2b) =	123.9600	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		123.9600	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.1420	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2899	0.2869	0.2839	0.2688	0.2658	0.2507	0.2507	0.2476	0.2567	0.2658	0.2718	0.2778	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	40.5300	10.8600	29.6700	0.2100	6.2307	110.0000	3263.6999	(29a)
Communal Wall	6.4900	2.0600	4.4300	0.2200	0.9746	110.0000	487.3000	(29a)
Cold Roof	51.6500		51.6500	0.0900	4.6485	9.0000	464.8500	(30)
Total net area of external elements Aum(A, m2)			98.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7609			(33)
Main dwelling								
Party Wall 1			32.2500	0.0000	0.0000	110.0000	3547.5000	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Internal Wall 1			98.9000			9.0000	890.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12268.9499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		237.5402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.4700	0.0380	0.4739
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.7300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	5.5000	0.0540	0.2970
P4 Party wall - Roof (insulation at ceiling level)	11.7300	0.1010	1.1847
E10 Eaves (insulation at ceiling level)	6.8200	0.0630	0.4297
E12 Gable (insulation at ceiling level)	9.9300	0.0980	0.9731
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1156 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 34.8765 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.8586	11.7351	11.6117	10.9945	10.8711	10.2539	10.2539	10.1305	10.5008	10.8711	11.1180	11.3648	(38)
Heat transfer coeff	46.7351	46.6117	46.4882	45.8711	45.7476	45.1304	45.1304	45.0070	45.3773	45.7476	45.9945	46.2414	(39)

Average = Sum(39)m / 12 = 45.8402

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9048	0.9025	0.9001	0.8881	0.8857	0.8738	0.8738	0.8714	0.8786	0.8857	0.8905	0.8953	(40)
HLP (average)												0.8875	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)

Energy content (annual) Total = Sum(45)m = 1662.4694

Distribution loss (46)m = 0.15 x (45)m

25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)

Total per year (kWh/year) = Sum(64)m = 2007.3944 (64)

12Total per year (kWh/year) 2007 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains	354.2931	362.0874	346.0852	331.8094	313.4656	300.6378	288.0966	289.2516	298.9655	310.8102	332.0596	346.5342	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

West				5.4200		19.6403		0.3300		0.0000		0.7700	27.0490 (80)
South				2.7200		46.7521		0.3300		0.0000		0.7700	32.3128 (78)
West				2.7200		19.6403		0.3300		0.0000		0.7700	13.5744 (80)
Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279 (83)	
Total gains	427.2292	494.4754	544.3684	598.8678	626.7770	616.4998	590.7218	557.5747	521.5941	462.1848	421.0139	407.8622 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.9225	73.1156	73.3097	74.2961	74.4966	75.5154	75.5154	75.7225	75.1045	74.4966	74.0967	73.7011	
alpha	5.8615	5.8744	5.8873	5.9531	5.9664	6.0344	6.0344	6.0482	6.0070	5.9664	5.9398	5.9134	
util living area	0.9865	0.9688	0.9290	0.8217	0.6556	0.4659	0.3358	0.3707	0.5888	0.8686	0.9698	0.9894	(86)
MIT	20.1866	20.3848	20.6182	20.8569	20.9670	20.9964	20.9996	20.9993	20.9863	20.8309	20.4750	20.1524	(87)
Th 2	20.1634	20.1654	20.1674	20.1776	20.1797	20.1898	20.1898	20.1919	20.1858	20.1797	20.1756	20.1715	(88)
util rest of house	0.9829	0.9608	0.9120	0.7868	0.6050	0.4081	0.2742	0.3059	0.5239	0.8327	0.9606	0.9864	(89)
MIT 2	19.2287	19.4776	19.7632	20.0430	20.1541	20.1879	20.1897	20.1916	20.1773	20.0239	19.6012	19.1920	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.7010	19.9249	20.1848	20.4443	20.5550	20.5866	20.5891	20.5899	20.5763	20.4218	20.0321	19.6656	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7010	19.9249	20.1848	20.4443	20.5550	20.5866	20.5891	20.5899	20.5763	20.4218	20.0321	19.6656	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9581	0.9124	0.7986	0.6286	0.4365	0.3046	0.3379	0.5554	0.8441	0.9587	0.9842	(94)
Useful gains	418.8322	473.7719	496.6843	478.2852	393.9639	269.1279	179.9326	188.3970	289.7135	390.1276	403.6400	401.3980	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	719.7692	700.3381	636.1829	529.5516	405.0930	270.1762	180.0289	188.5744	293.8759	449.3257	594.8059	715.1526	(97)
Space heating kWh	223.8971	152.2525	103.7869	36.9118	8.2801	0.0000	0.0000	0.0000	0.0000	44.0434	137.6394	233.4334	(98a)
Space heating requirement - total per year (kWh/year)												940.2447	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.8971	152.2525	103.7869	36.9118	8.2801	0.0000	0.0000	0.0000	0.0000	44.0434	137.6394	233.4334	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												940.2447	
Space heating per m2											(98c) / (4) =	18.2042	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	223.8971	152.2525	103.7869	36.9118	8.2801	0.0000	0.0000	0.0000	0.0000	44.0434	137.6394	233.4334	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	223.8971	152.2525	103.7869	36.9118	8.2801	0.0000	0.0000	0.0000	0.0000	44.0434	137.6394	233.4334	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.5460	6.8158	7.5460	7.3026	7.5460	7.3026	7.5460	7.5460	7.3026	7.5460	7.3026	7.5460	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												940.2447	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	88.8483	(230a)
Total electricity for the above, kWh/year	88.8483	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1720.3727	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	940.2447	0.1573	147.9295	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			226.2380	(265)
Pumps, fans and electric keep-hot	88.8483	0.1387	12.3244	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			258.2256	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	940.2447	1.5824	1487.8576	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)
Space and water heating			2332.4618	(279)
Pumps, fans and electric keep-hot	88.8483	1.5128	134.4098	(281)
Energy for lighting	136.2372	1.5338	208.9651	(282)
Total Primary energy kWh/year			2675.8367	(286)
Dwelling Primary energy Rate (DPER)			51.8100	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.4000	(2b) =	123.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	123.9600	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1613	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4113	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3496	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)

Adj infilt rate												
	0.4458	0.4371	0.4283	0.3846	0.3759	0.3322	0.3322	0.3234	0.3496	0.3759	0.3933	0.4108 (22b)
Effective ac	0.5994	0.5955	0.5917	0.5740	0.5706	0.5552	0.5552	0.5523	0.5611	0.5706	0.5774	0.5844 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			10.8600	1.1450	12.4351			(27)
Brickwork	40.5300	10.8600	29.6700	0.1800	5.3406			(29a)
Communal Wall	6.4900	2.0600	4.4300	0.1800	0.7974			(29a)
Cold Roof	51.6500		51.6500	0.1100	5.6815			(30)
Total net area of external elements Aum(A, m2)			98.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.3146			(33)
Main dwelling								
Party Wall 1			32.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 237.5402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.4700	0.0700	0.8729
E18 Party wall between dwellings	5.5000	0.0600	0.3300
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.7300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0500	0.9245
E16 Corner (normal)	5.5000	0.0900	0.4950
P4 Party wall - Roof (insulation at ceiling level)	11.7300	0.1200	1.4076
E10 Eaves (insulation at ceiling level)	6.8200	0.0600	0.4092
E12 Gable (insulation at ceiling level)	9.9300	0.0600	0.5958
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E5 Ground floor (normal)	24.5000	0.1600	3.9200
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2330 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 35.5476 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.5181	24.3603	24.2056	23.4789	23.3429	22.7100	22.7100	22.5928	22.9538	23.3429	23.6180	23.9055	(38)
Heat transfer coeff	60.0657	59.9079	59.7532	59.0265	58.8905	58.2576	58.2576	58.1404	58.5014	58.8905	59.1656	59.4531	(39)
Average = Sum(39)m / 12 =												59.0259	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1629	1.1599	1.1569	1.1428	1.1402	1.1279	1.1279	1.1257	1.1327	1.1402	1.1455	1.1511	(40)
HLP (average)												1.1428	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy											1.7387	(42)
Hot water usage for mixer showers												
	53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680 (42a)
Hot water usage for baths												
	23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972 (42b)
Hot water usage for other uses												
	32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365 (42c)
Average daily hot water use (litres/day)												100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m													
	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	219.0409	193.8256	206.0225	181.1975	175.7315	158.4238	156.3170	162.4195	164.1044	182.9195	194.4456	216.6389	(62)
WWHRS	-24.3997	-21.5793	-22.5966	-18.7109	-17.4379	-14.9217	-13.9867	-14.8735	-15.4386	-18.2004	-20.6188	-23.9478	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
										Total per year (kWh/year) = Sum(64)m =		1984.3750	(64)
12Total per year (kWh/year)												1984	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	94.6142	84.1221	90.2856	81.3286	80.2138	73.7564	73.7585	75.7876	75.6451	82.6039	85.7336	93.8156	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	86.9373	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	76.6264	84.8363	76.6264	79.1806	76.6264	79.1806	76.6264	76.6264	79.1806	76.6264	79.1806	76.6264	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	151.5179	153.0902	149.1281	140.6933	130.0458	120.0387	113.3533	111.7810	115.7431	124.1780	134.8254	144.8326	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	31.6937	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	127.1696	125.1817	121.3516	112.9564	107.8143	102.4394	99.1378	101.8651	105.0627	111.0267	119.0744	126.0962	(72)
Total internal gains													
	407.3951	415.1894	399.1873	384.9114	366.5676	350.7398	338.1986	339.3536	349.0676	363.9122	385.1616	399.6363	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.7200	46.7521	0.6300	0.7000	0.7700	38.8635	(78)
West	8.1400	19.6403	0.6300	0.7000	0.7700	48.8589	(80)

Solar gains	87.7223	159.2267	238.4806	321.1985	376.8282	379.8959	363.9756	322.7195	267.7615	182.0625	106.9877	73.7608	(83)
Total gains	495.1174	574.4161	637.6679	706.1099	743.3958	730.6357	702.1742	662.0732	616.8290	545.9747	492.1494	473.3971	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.7385	56.8880	57.0353	57.7375	57.8708	58.4995	58.4995	58.6174	58.2557	57.8708	57.6018	57.3232	
alpha	4.7826	4.7925	4.8024	4.8492	4.8581	4.9000	4.9000	4.9078	4.8837	4.8581	4.8401	4.8215	
util living area													
	0.9824	0.9645	0.9271	0.8337	0.6840	0.5009	0.3634	0.4011	0.6233	0.8732	0.9648	0.9854	(86)
MIT	19.8864	20.1148	20.4061	20.7285	20.9151	20.9851	20.9975	20.9959	20.9584	20.7062	20.2484	19.8501	(87)
Th 2	19.9498	19.9522	19.9546	19.9660	19.9682	19.9781	19.9781	19.9799	19.9743	19.9682	19.9638	19.9593	(88)
util rest of house													
	0.9774	0.9549	0.9081	0.7952	0.6234	0.4249	0.2799	0.3136	0.5425	0.8336	0.9535	0.9812	(89)
MIT 2	18.6884	18.9747	19.3319	19.7115	19.9030	19.9702	19.9773	19.9786	19.9491	19.6999	19.1541	18.6498	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.2791	19.5369	19.8616	20.2130	20.4021	20.4706	20.4804	20.4803	20.4468	20.1961	19.6937	19.2417	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2791	19.5369	19.8616	20.2130	20.4021	20.4706	20.4804	20.4803	20.4468	20.1961	19.6937	19.2417	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9733	0.9503	0.9061	0.8051	0.6497	0.4620	0.3211	0.3568	0.5808	0.8433	0.9500	0.9775	(94)
Useful gains	481.9055	545.8592	577.8093	568.4847	483.0086	337.5478	225.4669	236.2375	358.2505	460.4009	467.5200	462.7602	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	899.7333	876.8656	798.4001	667.7660	512.4689	342.0094	226.0615	237.2281	371.2997	565.1225	745.1149	894.2788	(97)
Space heating kWh													
	310.8639	222.4363	164.1196	71.4825	21.9184	0.0000	0.0000	0.0000	0.0000	77.9128	199.8683	321.0499	(98a)
Space heating requirement - total per year (kWh/year)												1389.6516	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	310.8639	222.4363	164.1196	71.4825	21.9184	0.0000	0.0000	0.0000	0.0000	77.9128	199.8683	321.0499	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1389.6516	
Space heating per m2											(98c) / (4) =	26.9052	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	310.8639	222.4363	164.1196	71.4825	21.9184	0.0000	0.0000	0.0000	0.0000	77.9128	199.8683	321.0499	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	336.7973	240.9927	177.8110	77.4458	23.7469	0.0000	0.0000	0.0000	0.0000	84.4126	216.5420	347.8330	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	194.6412	172.2463	183.4259	162.4866	158.2936	143.5022	142.3303	147.5461	148.6658	164.7192	173.8268	192.6911	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1043	84.6343	83.8113	82.3500	80.7960	79.8000	79.8000	79.8000	79.8000	82.4845	84.3736	85.1961	(217)
Fuel for water heating, kWh/month													
	228.7090	203.5183	218.8560	197.3123	195.9177	179.8273	178.3588	184.8948	186.2980	199.6971	206.0202	226.1737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9214	12.7728	11.5005	8.4257	6.5083	5.3173	5.9371	7.7172	10.0239	13.1519	14.8551	16.3640	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-13.9766	-20.7826	-31.4959	-37.4135	-42.1278	-39.9999	-39.5329	-36.4411	-31.2895	-24.6504	-15.7505	-11.9625 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.9299	-10.6083	-21.5278	-32.9858	-44.2484	-44.6716	-44.1257	-37.0541	-26.7727	-15.3613	-6.6443	-3.8795 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1505.5814	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2405.5832	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	128.4952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-638.2327	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3487.4271	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1505.5814	0.2100	316.1721	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2405.5832	0.2100	505.1725	(264)
Space and water heating			821.3446	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.4952	0.1443	18.5458	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	0.1335	-46.1008	
PV Unit electricity exported	-292.8094	0.1253	-36.6969	
Total			-82.7977	(269)
Total CO2, kg/year			769.0220	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1505.5814	1.1300	1701.3070	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2405.5832	1.1300	2718.3090	(278)
Space and water heating			4419.6160	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.4952	1.5338	197.0902	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-345.4233	1.4932	-515.7819	
PV Unit electricity exported	-292.8094	0.4600	-134.6951	
Total			-650.4770	(283)
Total Primary energy kWh/year			4096.3300	(286)
Target Primary Energy Rate (TPER)			79.3100	(287)

Full SAP Calculation Printout

Plot Reference	P-31	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-31
Plot Address	Flat 11, 99 Caversham Road, Reading, RG1 8GS	**SAP Version**	10.2

SAP Rating	84 B	**DER**	5.00	**TER**	14.89
Environmental	97 A	**% DER < TER**			66.42
CO_2 Emissions (t/year)	0.21	**DFEE**	34.79	**TFEE**	35.86
Compliance Check	See BREL	**% DFEE < TFEE**			2.98
% DPER < TPER	34.68	**DPER**	51.81	**TPER**	79.31

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.4000	(2b) =	123.9600	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	123.9600	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.1420	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2899	0.2869	0.2839	0.2688	0.2658	0.2507	0.2507	0.2476	0.2567	0.2658	0.2718	0.2778	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	40.5300	10.8600	29.6700	0.2100	6.2307	110.0000	3263.6999	(29a)
Communal Wall	6.4900	2.0600	4.4300	0.2200	0.9746	110.0000	487.3000	(29a)
Cold Roof	51.6500		51.6500	0.0900	4.6485	9.0000	464.8500	(30)
Total net area of external elements Aum(A, m2)			98.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7609			(33)
Main dwelling								
Party Wall 1			32.2500	0.0000	0.0000	110.0000	3547.5000	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Internal Wall 1			98.9000			9.0000	890.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12268.9499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		237.5402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.4700	0.0380	0.4739
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.7300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	5.5000	0.0540	0.2970
P4 Party wall - Roof (insulation at ceiling level)	11.7300	0.1010	1.1847
E10 Eaves (insulation at ceiling level)	6.8200	0.0630	0.4297
E12 Gable (insulation at ceiling level)	9.9300	0.0980	0.9731
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1156 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 34.8765 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.8586	11.7351	11.6117	10.9945	10.8711	10.2539	10.2539	10.1305	10.5008	10.8711	11.1180	11.3648	(38)
Heat transfer coeff	46.7351	46.6117	46.4882	45.8711	45.7476	45.1304	45.1304	45.0070	45.3773	45.7476	45.9945	46.2414	(39)

Average = Sum(39)m / 12 = 45.8402

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9048	0.9025	0.9001	0.8881	0.8857	0.8738	0.8738	0.8714	0.8786	0.8857	0.8905	0.8953	(40)
HLP (average)												0.8875	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7387 (42)

Hot water usage for mixer showers

53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day) 100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)

Energy content (annual) Total = Sum(45)m = 1662.4694

Distribution loss (46)m = 0.15 x (45)m

25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7500 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)

Total per year (kWh/year) = Sum(64)m = 2007.3944 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)

South			2.7200		46.7521		0.3300		0.0000		0.7700		32.3128 (78)
West			2.7200		19.6403		0.3300		0.0000		0.7700		13.5744 (80)
Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279 (83)	
Total gains	477.3818	535.0361	587.9888	632.3953	654.9515	635.9633	609.9827	578.2176	544.8330	495.5167	459.6987	455.2580 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.9225	73.1156	73.3097	74.2961	74.4966	75.5154	75.5154	75.7225	75.1045	74.4966	74.0967	73.7011	
alpha	5.8615	5.8744	5.8873	5.9531	5.9664	6.0344	6.0344	6.0482	6.0070	5.9664	5.9398	5.9134	
util living area	0.9775	0.9564	0.9063	0.7949	0.6313	0.4520	0.3253	0.3576	0.5657	0.8385	0.9559	0.9820	(86)
MIT	20.2888	20.4588	20.6798	20.8810	20.9728	20.9969	20.9997	20.9994	20.9889	20.8629	20.5458	20.2513	(87)
Th 2	20.1634	20.1654	20.1674	20.1776	20.1797	20.1898	20.1898	20.1919	20.1858	20.1797	20.1756	20.1715	(88)
util rest of house	0.9716	0.9459	0.8858	0.7582	0.5814	0.3958	0.2655	0.2950	0.5026	0.7990	0.9435	0.9773	(89)
MIT 2	19.3564	19.5678	19.8340	20.0672	20.1588	20.1882	20.1897	20.1917	20.1790	20.0561	19.6866	19.3161	(90)
Living area fraction									fLA = Living area / (4) =			0.4931	(91)
MIT	19.8162	20.0072	20.2511	20.4685	20.5602	20.5870	20.5891	20.5900	20.5784	20.4539	20.1103	19.7773	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8162	20.0072	20.2511	20.4685	20.5602	20.5870	20.5891	20.5900	20.5784	20.4539	20.1103	19.7773	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9688	0.9436	0.8880	0.7717	0.6049	0.4235	0.2950	0.3259	0.5334	0.8130	0.9423	0.9745	(94)
Useful gains	462.4663	504.8770	522.1363	488.0136	396.1904	269.3056	179.9505	188.4335	290.6010	402.8483	433.1964	443.6611	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	725.1526	704.1697	639.2647	530.6596	405.3341	270.1952	180.0310	188.5785	293.9712	450.7938	598.4020	720.3141	(97)
Space heating kWh	195.4386	133.9247	87.1435	30.7051	6.8029	0.0000	0.0000	0.0000	0.0000	35.6714	118.9480	205.8298	(98a)
Space heating requirement - total per year (kWh/year)												814.4642	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	195.4386	133.9247	87.1435	30.7051	6.8029	0.0000	0.0000	0.0000	0.0000	35.6714	118.9480	205.8298	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												814.4642	
Space heating per m2										(98c) / (4) =		15.7689	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	195.4386	133.9247	87.1435	30.7051	6.8029	0.0000	0.0000	0.0000	0.0000	35.6714	118.9480	205.8298	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	195.4386	133.9247	87.1435	30.7051	6.8029	0.0000	0.0000	0.0000	0.0000	35.6714	118.9480	205.8298	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.5460	6.8158	7.5460	7.3026	7.5460	7.3026	7.5460	7.5460	7.3026	7.5460	7.3026	7.5460	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												814.4642	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	88.8483	(230a)
Total electricity for the above, kWh/year	88.8483	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1594.5921	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	814.4642	16.4900	134.3051	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	16.4900	91.5265	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	88.8483	16.4900	14.6511	(249)
Energy for lighting	136.2372	16.4900	22.4655	(250)
Additional standing charges			0.0000	(251)
Total energy cost			262.9482	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9794	(257)
SAP value		84.1235	
SAP rating (Section 12)		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	814.4642	0.1575	128.2690	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			206.5775	(265)
Pumps, fans and electric keep-hot	88.8483	0.1387	12.3244	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			238.5651	(272)
CO2 emissions per m2			4.6200	(273)
EI value			96.6924	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	51.6500 (1b)	x 2.4000 (2b)	= 123.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.6500				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 123.9600	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8400 (17)
Infiltration rate		0.1420 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1298	0.1237	0.1237	0.1147	0.1177	0.1026	0.1026	0.0996	0.1026	0.1147	0.1116	0.1207	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2658	0.2597	0.2597	0.2507	0.2537	0.2386	0.2386	0.2356	0.2386	0.2507	0.2476	0.2567	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	40.5300	10.8600	29.6700	0.2100	6.2307	110.0000	3263.6999	(29a)
Communal Wall	6.4900	2.0600	4.4300	0.2200	0.9746	110.0000	487.3000	(29a)
Cold Roof	51.6500		51.6500	0.0900	4.6485	9.0000	464.8500	(30)
Total net area of external elements Aum(A, m2)			98.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7609			(33)
Main dwelling								
Party Wall 1			32.2500	0.0000	0.0000	110.0000	3547.5000	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Internal Wall 1			98.9000			9.0000	890.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12268.9499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	237.5402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.4700	0.0380	0.4739
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.7300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	5.5000	0.0540	0.2970
P4 Party wall - Roof (insulation at ceiling level)	11.7300	0.1010	1.1847
E10 Eaves (insulation at ceiling level)	6.8200	0.0630	0.4297
E12 Gable (insulation at ceiling level)	9.9300	0.0980	0.9731
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.1156 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	34.8765 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.8711	10.6242	10.6242	10.2539	10.3773	9.7602	9.7602	9.6367	9.7602	10.2539	10.1305	10.5008	(38)
Heat transfer coeff	45.7476	45.5008	45.5008	45.1304	45.2539	44.6367	44.6367	44.5133	44.6367	45.1304	45.0070	45.3773	(39)
Average = Sum(39)m / 12 =												45.0893	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8857	0.8809	0.8809	0.8738	0.8762	0.8642	0.8642	0.8618	0.8642	0.8738	0.8714	0.8786	(40)
HLP (average)												0.8730	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7387 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)

Hot water usage for baths

23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)

Hot water usage for other uses

32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)

Average daily hot water use (litres/day)	100.0897 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	

Distribution loss (46)m = 0.15 x (45)m

25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)

Water storage loss (or HIU loss):	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.7500 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.9450 (55)

Total storage loss

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)

If cylinder contains dedicated solar storage

29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
									Total per year (kWh/year) = Sum(64)m =			2007.3944	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains													
	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
South	2.7200	54.2217	0.3300	0.0000	0.7700	37.4754	(78)
West	2.7200	23.8018	0.3300	0.0000	0.7700	16.4506	(80)

Solar gains	86.7064	137.5977	204.8017	280.5280	321.2121	342.8499	325.1121	295.1017	245.2762	168.9195	104.1885	73.3186	(83)
Total gains	491.1520	540.2458	594.5073	645.8648	662.8522	662.9512	632.4697	604.9961	567.4807	513.0615	474.9329	467.2486	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.4966	74.9008	74.9008	75.5154	75.3094	76.3507	76.3507	76.5624	76.3507	75.5154	75.7225	75.1045	
alpha	5.9664	5.9934	5.9934	6.0344	6.0206	6.0900	6.0900	6.1042	6.0900	6.0344	6.0482	6.0070	
util living area													
	0.9666	0.9410	0.8736	0.7305	0.5459	0.3497	0.2329	0.2501	0.4694	0.7708	0.9308	0.9728	(86)
MIT	20.4254	20.5724	20.7736	20.9336	20.9893	20.9994	21.0000	20.9999	20.9966	20.9242	20.6737	20.3919	(87)
Th 2	20.1797	20.1837	20.1837	20.1898	20.1878	20.1980	20.1980	20.2001	20.1980	20.1898	20.1919	20.1858	(88)
util rest of house													
	0.9581	0.9271	0.8475	0.6884	0.4938	0.2960	0.1763	0.1913	0.4078	0.7225	0.9121	0.9656	(89)
MIT 2	19.5397	19.7216	19.9563	20.1320	20.1805	20.1978	20.1980	20.2001	20.1963	20.1269	19.8537	19.5037	(90)
Living area fraction										fLA = Living area / (4) =		0.4931	(91)
MIT	19.9765	20.1412	20.3593	20.5273	20.5793	20.5931	20.5935	20.5945	20.5910	20.5201	20.2581	19.9417	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9765	20.1412	20.3593	20.5273	20.5793	20.5931	20.5935	20.5945	20.5910	20.5201	20.2581	19.9417	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9557	0.9262	0.8535	0.7064	0.5191	0.3225	0.2042	0.2203	0.4381	0.7430	0.9138	0.9631	(94)
Useful gains	469.3829	500.4002	507.3975	456.2416	344.0952	213.7999	129.1489	133.2850	248.6203	381.1796	433.9889	450.0021	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	680.5624	657.0841	589.6597	479.6140	347.5198	213.9478	129.1553	133.2952	249.5623	407.0799	551.6991	673.4756	(97)
Space heating kWh													
	157.1176	105.2915	61.2031	16.8281	2.5479	0.0000	0.0000	0.0000	0.0000	19.2698	84.7513	166.2643	(98a)
Space heating requirement - total per year (kWh/year)												613.2737	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	157.1176	105.2915	61.2031	16.8281	2.5479	0.0000	0.0000	0.0000	0.0000	19.2698	84.7513	166.2643	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												613.2737	
Space heating per m2											(98c) / (4) =	11.8736	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	157.1176	105.2915	61.2031	16.8281	2.5479	0.0000	0.0000	0.0000	0.0000	19.2698	84.7513	166.2643	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	157.1176	105.2915	61.2031	16.8281	2.5479	0.0000	0.0000	0.0000	0.0000	19.2698	84.7513	166.2643	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month													
	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.5460	6.8158	7.5460	7.3026	7.5460	7.3026	7.5460	7.5460	7.3026	7.5460	7.3026	7.5460	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												613.2737	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												361.6650	
Water heating fuel used												555.0425	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)													
mechanical ventilation fans (SFP = 0.5875)												88.8483	(230a)
Total electricity for the above, kWh/year												88.8483	(231)
Electricity for lighting (calculated in Appendix L)												136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1393.4017	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	613.2737	27.6700	169.6928	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	27.6700	153.5803	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	88.8483	27.6700	24.5843	(249)
Energy for lighting	136.2372	27.6700	37.6968	(250)
Additional standing charges			0.0000	(251)
Total energy cost			385.5542	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	613.2737	0.1583	97.0829	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			175.3914	(265)
Pumps, fans and electric keep-hot	88.8483	0.1387	12.3244	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			207.3790	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	613.2737	1.5860	972.6463	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)

Space and water heating			1817.2505 (279)
Pumps, fans and electric keep-hot	88.8483	1.5128	134.4098 (281)
Energy for lighting	136.2372	1.5338	208.9651 (282)
Total Primary energy kWh/year			2160.6254 (286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 84
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£386	£386	£0
Space heating	£194	£194	£0
Water heating	£154	£154	£0
Lighting	£38	£38	£0
Total cost of fuels	£386	£386	£0
Total cost of uses	£386	£386	£0
Delivered energy	27 kWh/m²	27 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	42 kWh/m²	42 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500 (1b)	x	2.4000 (2b)	=	123.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	123.9600	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8400	(17)
Infiltration rate		0.1420	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.8000	(23c)
Effective ac	0.2899	0.2869	0.2839	0.2688	0.2658	0.2507	0.2507	0.2476	0.2567	0.2658	0.2718	0.2778	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	40.5300	10.8600	29.6700	0.2100	6.2307	110.0000	3263.6999	(29a)
Communal Wall	6.4900	2.0600	4.4300	0.2200	0.9746	110.0000	487.3000	(29a)
Cold Roof	51.6500		51.6500	0.0900	4.6485	9.0000	464.8500	(30)
Total net area of external elements Aum(A, m2)			98.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7609			(33)
Main dwelling								
Party Wall 1			32.2500	0.0000	0.0000	110.0000	3547.5000	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Internal Wall 1			98.9000			9.0000	890.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12268.9499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		237.5402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.4700	0.0380	0.4739
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.7300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	5.5000	0.0540	0.2970
P4 Party wall - Roof (insulation at ceiling level)	11.7300	0.1010	1.1847
E10 Eaves (insulation at ceiling level)	6.8200	0.0630	0.4297
E12 Gable (insulation at ceiling level)	9.9300	0.0980	0.9731
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.1156 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	34.8765 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.8586	11.7351	11.6117	10.9945	10.8711	10.2539	10.2539	10.1305	10.5008	10.8711	11.1180	11.3648	(38)
Heat transfer coeff	46.7351	46.6117	46.4882	45.8711	45.7476	45.1304	45.1304	45.0070	45.3773	45.7476	45.9945	46.2414	(39)
Average = Sum(39)m / 12 =												45.8402	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9048	0.9025	0.9001	0.8881	0.8857	0.8738	0.8738	0.8714	0.8786	0.8857	0.8905	0.8953	(40)
HLP (average)												0.8875	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7387 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)
Hot water usage for baths	23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)
Hot water usage for other uses	32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)
Average daily hot water use (litres/day)												100.0897	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
										Total per year (kWh/year) = Sum(64)m =		2007.3944	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains													
	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
West	2.7200	19.6403	0.3300	0.0000	0.7700	13.5744	(80)

Solar gains	72.9362	132.3880	198.2832	267.0585	313.3114	315.8620	302.6252	268.3231	222.6286	151.3747	88.9543	61.3279	(83)
Total gains	477.3818	535.0361	587.9888	632.3953	654.9515	635.9633	609.9827	578.2176	544.8330	495.5167	459.6987	455.2580	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.9225	73.1156	73.3097	74.2961	74.4966	75.5154	75.5154	75.7225	75.1045	74.4966	74.0967	73.7011	
alpha	5.8615	5.8744	5.8873	5.9531	5.9664	6.0344	6.0344	6.0482	6.0070	5.9664	5.9398	5.9134	
util living area													
	0.9775	0.9564	0.9063	0.7949	0.6313	0.4520	0.3253	0.3576	0.5657	0.8385	0.9559	0.9820	(86)
MIT	20.2888	20.4588	20.6798	20.8810	20.9728	20.9969	20.9997	20.9994	20.9889	20.8629	20.5458	20.2513	(87)
Th 2	20.1634	20.1654	20.1674	20.1776	20.1797	20.1898	20.1898	20.1919	20.1858	20.1797	20.1756	20.1715	(88)
util rest of house													
	0.9716	0.9459	0.8858	0.7582	0.5814	0.3958	0.2655	0.2950	0.5026	0.7990	0.9435	0.9773	(89)
MIT 2	19.3564	19.5678	19.8340	20.0672	20.1588	20.1882	20.1897	20.1917	20.1790	20.0561	19.6866	19.3161	(90)
Living area fraction									fLA = Living area / (4) =			0.4931	(91)
MIT	19.8162	20.0072	20.2511	20.4685	20.5602	20.5870	20.5891	20.5900	20.5784	20.4539	20.1103	19.7773	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8162	20.0072	20.2511	20.4685	20.5602	20.5870	20.5891	20.5900	20.5784	20.4539	20.1103	19.7773	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9688	0.9436	0.8880	0.7717	0.6049	0.4235	0.2950	0.3259	0.5334	0.8130	0.9423	0.9745	(94)
Useful gains	462.4663	504.8770	522.1363	488.0136	396.1904	269.3056	179.9505	188.4335	290.6010	402.8483	433.1964	443.6611	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	725.1526	704.1697	639.2647	530.6596	405.3341	270.1952	180.0310	188.5785	293.9712	450.7938	598.4020	720.3141	(97)
Space heating kWh													
	195.4386	133.9247	87.1435	30.7051	6.8029	0.0000	0.0000	0.0000	0.0000	35.6714	118.9480	205.8298	(98a)
Space heating requirement - total per year (kWh/year)												814.4642	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	195.4386	133.9247	87.1435	30.7051	6.8029	0.0000	0.0000	0.0000	0.0000	35.6714	118.9480	205.8298	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												814.4642	
Space heating per m2											(98c) / (4) =	15.7689	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	195.4386	133.9247	87.1435	30.7051	6.8029	0.0000	0.0000	0.0000	0.0000	35.6714	118.9480	205.8298	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	195.4386	133.9247	87.1435	30.7051	6.8029	0.0000	0.0000	0.0000	0.0000	35.6714	118.9480	205.8298	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating
Water heating requirement

	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390 (64)
Efficiency of water heater												361.6650 (216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650 (217)
Fuel for water heating, kWh/month												
	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.5460	6.8158	7.5460	7.3026	7.5460	7.3026	7.5460	7.5460	7.3026	7.5460	7.3026	7.5460 (231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	814.4642 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	361.6650
Water heating fuel used	555.0425 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)

mechanical ventilation fans (SFP = 0.5875)	88.8483 (230a)
Total electricity for the above, kWh/year	88.8483 (231)
Electricity for lighting (calculated in Appendix L)	136.2372 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1594.5921 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	814.4642	16.4900	134.3051	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	16.4900	91.5265	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	88.8483	16.4900	14.6511	(249)
Energy for lighting	136.2372	16.4900	22.4655	(250)
Additional standing charges			0.0000	(251)
Total energy cost			262.9482	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9794 (257)
SAP value		84.1235
SAP rating (Section 12)		84 (258)
SAP band		B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	814.4642	0.1575	128.2690	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			206.5775	(265)
Pumps, fans and electric keep-hot	88.8483	0.1387	12.3244	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			238.5651	(272)
CO2 emissions per m2			4.6200	(273)
EI value			96.6924	
EI rating			97	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	51.6500	(1b)	x 2.4000	(2b) =	123.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	123.9600	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8400 (17)
Infiltration rate		0.1420 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1298	0.1237	0.1237	0.1147	0.1177	0.1026	0.1026	0.0996	0.1026	0.1147	0.1116	0.1207	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	72.8000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2658	0.2597	0.2597	0.2507	0.2537	0.2386	0.2386	0.2356	0.2386	0.2507	0.2476	0.2567	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			5.4400	1.1450	6.2290			(27)
Brickwork	40.5300	10.8600	29.6700	0.2100	6.2307	110.0000	3263.6999	(29a)
Communal Wall	6.4900	2.0600	4.4300	0.2200	0.9746	110.0000	487.3000	(29a)
Cold Roof	51.6500		51.6500	0.0900	4.6485	9.0000	464.8500	(30)
Total net area of external elements Aum(A, m2)			98.6700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7609			(33)
Main dwelling								
Party Wall 1			32.2500	0.0000	0.0000	110.0000	3547.5000	(32)
Party Floor 1			51.6500			70.0000	3615.5000	(32d)
Internal Wall 1			98.9000			9.0000	890.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12268.9499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		237.5402 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	12.4700	0.0380	0.4739
E18 Party wall between dwellings	5.5000	0.0380	0.2090
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.7300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
E2 Other lintels (including other steel lintels)	5.5500	0.0500	0.2775
E4 Jamb	18.4900	0.0160	0.2958
E16 Corner (normal)	5.5000	0.0540	0.2970
P4 Party wall - Roof (insulation at ceiling level)	11.7300	0.1010	1.1847
E10 Eaves (insulation at ceiling level)	6.8200	0.0630	0.4297
E12 Gable (insulation at ceiling level)	9.9300	0.0980	0.9731
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E5 Ground floor (normal)	24.5000	0.1120	2.7440
E25 Staggered party wall between dwellings	2.8500	0.0310	0.0883

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.1156 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	34.8765 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	10.8711	10.6242	10.6242	10.2539	10.3773	9.7602	9.7602	9.6367	9.7602	10.2539	10.1305	10.5008	(38)
Heat transfer coeff	45.7476	45.5008	45.5008	45.1304	45.2539	44.6367	44.6367	44.5133	44.6367	45.1304	45.0070	45.3773	(39)
Average = Sum(39)m / 12 =												45.0893	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8857	0.8809	0.8809	0.8738	0.8762	0.8642	0.8642	0.8618	0.8642	0.8738	0.8714	0.8786	(40)
HLP (average)												0.8730	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7387	(42)
Hot water usage for mixer showers													
	53.3725	52.5705	51.4017	49.1654	47.5151	45.6746	44.6285	45.7885	47.0600	49.0361	51.3204	53.1680	(42a)
Hot water usage for baths													
	23.0752	22.7325	22.2499	21.3601	20.6938	19.9550	19.5559	20.0351	20.5569	21.3475	22.2556	22.9972	(42b)
Hot water usage for other uses													
	32.4365	31.2570	30.0775	28.8980	27.7185	26.5389	26.5389	27.7185	28.8980	30.0775	31.2570	32.4365	(42c)
Average daily hot water use (litres/day)												100.0897	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	108.8842	106.5599	103.7290	99.4234	95.9273	92.1686	90.7234	93.5421	96.5149	100.4610	104.8330	108.6017	(44)
Energy conte	172.4459	151.7399	159.4276	136.1057	129.1366	113.3320	109.7221	115.8246	119.0125	136.3246	149.3538	170.0440	(45)
Energy content (annual)										Total = Sum(45)m =		1662.4694	
Distribution loss (46)m = 0.15 x (45)m													
	25.8669	22.7610	23.9141	20.4159	19.3705	16.9998	16.4583	17.3737	17.8519	20.4487	22.4031	25.5066	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9450	(55)
Total storage loss													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(56)
If cylinder contains dedicated solar storage													
	29.2950	26.4600	29.2950	28.3500	29.2950	28.3500	29.2950	29.2950	28.3500	29.2950	28.3500	29.2950	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
										Total per year (kWh/year) = Sum(64)m =		2007.3944	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.3383	50.4535	53.0097	45.2551	42.9379	37.6829	36.4826	38.5117	39.5717	45.3279	49.6601	56.5396	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	104.3247	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.2858	17.1295	13.9306	10.5464	7.8835	6.6556	7.1916	9.3479	12.5468	15.9310	18.5939	19.8218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	226.1462	228.4929	222.5793	209.9900	194.0982	179.1622	169.1840	166.8373	172.7509	185.3402	201.2320	216.1680	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	47.1712	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	-69.5498	(71)
Water heating gains (Table 5)													
	77.0676	75.0796	71.2496	62.8544	57.7122	52.3374	49.0358	51.7630	54.9606	60.9246	68.9724	75.9941	(72)
Total internal gains													
	404.4456	402.6481	389.7056	365.3368	341.6401	320.1013	307.3575	309.8944	322.2045	344.1420	370.7444	393.9300	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
South	2.7200	54.2217	0.3300	0.0000	0.7700	37.4754	(78)
West	2.7200	23.8018	0.3300	0.0000	0.7700	16.4506	(80)

Solar gains	86.7064	137.5977	204.8017	280.5280	321.2121	342.8499	325.1121	295.1017	245.2762	168.9195	104.1885	73.3186	(83)
Total gains	491.1520	540.2458	594.5073	645.8648	662.8522	662.9512	632.4697	604.9961	567.4807	513.0615	474.9329	467.2486	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.4966	74.9008	74.9008	75.5154	75.3094	76.3507	76.3507	76.5624	76.3507	75.5154	75.7225	75.1045	
alpha	5.9664	5.9934	5.9934	6.0344	6.0206	6.0900	6.0900	6.1042	6.0900	6.0344	6.0482	6.0070	
util living area													
	0.9666	0.9410	0.8736	0.7305	0.5459	0.3497	0.2329	0.2501	0.4694	0.7708	0.9308	0.9728	(86)
MIT	20.4254	20.5724	20.7736	20.9336	20.9893	20.9994	21.0000	20.9999	20.9966	20.9242	20.6737	20.3919	(87)
Th 2	20.1797	20.1837	20.1837	20.1898	20.1878	20.1980	20.1980	20.2001	20.1980	20.1898	20.1919	20.1858	(88)
util rest of house													
	0.9581	0.9271	0.8475	0.6884	0.4938	0.2960	0.1763	0.1913	0.4078	0.7225	0.9121	0.9656	(89)
MIT 2	19.5397	19.7216	19.9563	20.1320	20.1805	20.1978	20.1980	20.2001	20.1963	20.1269	19.8537	19.5037	(90)
Living area fraction									fLA = Living area / (4) =			0.4931	(91)
MIT	19.9765	20.1412	20.3593	20.5273	20.5793	20.5931	20.5935	20.5945	20.5910	20.5201	20.2581	19.9417	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9765	20.1412	20.3593	20.5273	20.5793	20.5931	20.5935	20.5945	20.5910	20.5201	20.2581	19.9417	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9557	0.9262	0.8535	0.7064	0.5191	0.3225	0.2042	0.2203	0.4381	0.7430	0.9138	0.9631	(94)
Useful gains	469.3829	500.4002	507.3975	456.2416	344.0952	213.7999	129.1489	133.2850	248.6203	381.1796	433.9889	450.0021	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	680.5624	657.0841	589.6597	479.6140	347.5198	213.9478	129.1553	133.2952	249.5623	407.0799	551.6991	673.4756	(97)
Space heating kWh	157.1176	105.2915	61.2031	16.8281	2.5479	0.0000	0.0000	0.0000	0.0000	19.2698	84.7513	166.2643	(98a)
Space heating requirement - total per year (kWh/year)												613.2737	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	157.1176	105.2915	61.2031	16.8281	2.5479	0.0000	0.0000	0.0000	0.0000	19.2698	84.7513	166.2643	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												613.2737	
Space heating per m2											(98c) / (4) =	11.8736	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	157.1176	105.2915	61.2031	16.8281	2.5479	0.0000	0.0000	0.0000	0.0000	19.2698	84.7513	166.2643	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	157.1176	105.2915	61.2031	16.8281	2.5479	0.0000	0.0000	0.0000	0.0000	19.2698	84.7513	166.2643	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	201.7409	178.1999	188.7226	164.4557	158.4316	141.6820	139.0171	145.1196	147.3625	165.6196	177.7038	199.3390	(64)
Efficiency of water heater												361.6650	(216)
(217)m	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	361.6650	(217)
Fuel for water heating, kWh/month	55.7812	49.2721	52.1816	45.4718	43.8062	39.1749	38.4381	40.1254	40.7456	45.7937	49.1349	55.1170	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.5460	6.8158	7.5460	7.3026	7.5460	7.3026	7.5460	7.5460	7.3026	7.5460	7.3026	7.5460	(231)
Lighting	16.8807	13.5423	12.1934	8.9334	6.9004	5.6377	6.2948	8.1822	10.6279	13.9443	15.7501	17.3499	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	613.2737	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	361.6650	
Water heating fuel used	555.0425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	88.8483	(230a)
Total electricity for the above, kWh/year	88.8483	(231)
Electricity for lighting (calculated in Appendix L)	136.2372	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1393.4017	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	613.2737	27.6700	169.6928	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	27.6700	153.5803	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	88.8483	27.6700	24.5843	(249)
Energy for lighting	136.2372	27.6700	37.6968	(250)

Additional standing charges	0.0000	(251)
Total energy cost	385.5542	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	613.2737	0.1583	97.0829	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	555.0425	0.1411	78.3085	(264)
Space and water heating			175.3914	(265)
Pumps, fans and electric keep-hot	88.8483	0.1387	12.3244	(267)
Energy for lighting	136.2372	0.1443	19.6632	(268)
Total CO2, kg/year			207.3790	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	613.2737	1.5860	972.6463	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	555.0425	1.5217	844.6042	(278)
Space and water heating			1817.2505	(279)
Pumps, fans and electric keep-hot	88.8483	1.5128	134.4098	(281)
Energy for lighting	136.2372	1.5338	208.9651	(282)
Total Primary energy kWh/year			2160.6254	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-32	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-32
Plot Address	Flat 1, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	7.91	**TER**	16.77
Environmental	95 A	**% DER < TER**			52.83
CO_2 Emissions (t/year)	0.37	**DFEE**	44.69	**TFEE**	46.22
Compliance Check	See BREL	**% DFEE < TFEE**			3.29
% DPER < TPER	9.04	**DPER**	81.26	**TPER**	89.34

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	33.89 m	55.10 m²	2.55 m

8.0 Living Area	24.44	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	60.18	45.05	0.00	None	15.13	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	19.98	17.92	0.50	Stairwell Access Corridor 1	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	10.62	10.62	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area
Cycle Store Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	16.00	16.00	0.70	Garage Single 1 Inside	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	28.22	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	122.68

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)

Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	55.10

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	55.10

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Patio Door	Brickwork	South East	6.71	
South	Window	Brickwork	South	5.62	
NorthEast	Window	Brickwork	North East	2.81	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	33.89	0.11	0.11	RCD	No
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	33.89	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	22.05	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	9.45	-0.10	-0.10	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	7.14	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	23.40	0.02	0.02	RCD	Yes
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	8.96	0.00	0.02		No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes	
Approved Installation	No	
Mechanical Ventilation data Type	Database	
Type	Mechanical extract ventilation - centralised	
MV Reference Number	500743	
Configuration	2	
Manufacturer SFP	0.18	
Duct Type	Rigid	
Wet Rooms	2	

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa

Summary for Input Data

Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.93	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	6
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	Yes	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day
34.0 Small-scale Hydro	None	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-32	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-32
Plot Address	Flat 1, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	7.91	**TER**	16.77
Environmental	95 A	**% DER < TER**			52.83
CO_2 Emissions (t/year)	0.37	**DFEE**	44.69	**TFEE**	46.22
Compliance Check	See BREL	**% DFEE < TFEE**			3.29
% DPER < TPER	9.04	**DPER**	81.26	**TPER**	89.34

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.5050	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9300 (17)
Infiltration rate		0.1465 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1245 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1588	0.1557	0.1525	0.1370	0.1339	0.1183	0.1183	0.1152	0.1245	0.1339	0.1401	0.1463	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.7100	1.1450	7.6832			(27)
Window			8.4300	1.1450	9.6527			(27)
Ground Floor			55.1000	0.1200	6.6120	110.0000	6061.0000	(28a)
Brickwork	60.1800	15.1400	45.0400	0.2100	9.4584	110.0000	4954.4000	(29a)
Communal Wall	19.9800	2.0600	17.9200	0.2200	3.9424	110.0000	1971.1999	(29a)
Stairwell Wall	10.6200		10.6200	0.1600	1.6992	110.0000	1168.2000	(29a)
Cycle Store Wall	16.0000		16.0000	0.2100	3.3600	110.0000	1760.0000	(29a)
Total net area of external elements Aum(A, m2)			161.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.8799			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21776.1199	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 395.2109 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	33.8900	0.1120	3.7957
E7 Party floor between dwellings (in blocks of flats)	33.8900	0.0380	1.2878
E16 Corner (normal)	22.0500	0.0540	1.1907
E17 Corner (inverted - internal area greater than external area)	9.4500	-0.0970	-0.9166
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0890 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.9688 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	(39)
Average = Sum(39)m / 12 =												74.1522	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	(40)
HLP (average)												1.3458	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)
Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
										Total per year (kWh/year) = Sum(64)m =		2032.8510	(64)
12Total per year (kWh/year)												2033	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9252	89.5958	80.9252	83.6227	80.9252	83.6227	80.9252	80.9252	83.6227	80.9252	83.6227	80.9252	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains	371.4998	379.7838	362.9654	348.0681	328.7897	315.3442	302.1606	303.3100	313.5027	325.8913	348.1680	363.3129	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.7100	36.7938	0.3300	0.0000	0.7700	62.7339	(77)
Northeast	2.8100	11.2829	0.3300	0.0000	0.7700	8.0563	(75)
South	5.6200	46.7521	0.3300	0.0000	0.7700	66.7639	(78)

Solar gains	137.5541	232.5999	315.0369	387.1015	432.1783	428.8487	413.5103	379.6379	339.8120	256.0782	164.4156	117.9564	(83)
Total gains	509.0538	612.3836	678.0023	735.1696	760.9680	744.1928	715.6709	682.9479	653.3147	581.9695	512.5836	481.2694	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	
alpha	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	
util living area	0.9981	0.9933	0.9804	0.9352	0.8194	0.6245	0.4543	0.4966	0.7411	0.9543	0.9944	0.9987	(86)
MIT	20.0496	20.2379	20.4657	20.7271	20.9140	20.9872	20.9985	20.9974	20.9643	20.7191	20.3219	20.0042	(87)
Th 2	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	(88)
util rest of house	0.9971	0.9899	0.9702	0.9031	0.7459	0.5150	0.3319	0.3693	0.6331	0.9240	0.9908	0.9979	(89)
MIT 2	18.7327	18.9717	19.2561	19.5634	19.7493	19.8006	19.8049	19.8047	19.7894	19.5632	19.0800	18.6747	(90)
Living area fraction										fLA = Living area / (4) =		0.4436	(91)
MIT	19.3168	19.5334	19.7926	20.0796	20.2659	20.3269	20.3344	20.3338	20.3105	20.0760	19.6308	19.2644	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3168	19.5334	19.7926	20.0796	20.2659	20.3269	20.3344	20.3338	20.3105	20.0760	19.6308	19.2644	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9889	0.9701	0.9116	0.7764	0.5639	0.3864	0.4261	0.6813	0.9323	0.9901	0.9975	(94)
Useful gains	507.2587	605.5791	657.7224	670.1698	590.7999	419.6630	276.5347	290.9964	445.0727	542.5602	507.5329	480.0558	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1113.5276	1085.0951	985.6764	828.9890	635.1821	424.6631	276.9108	291.6965	460.5216	702.6623	929.1892	1117.0597	(97)
Space heating kWh	451.0641	322.2348	243.9978	114.3499	33.0204	0.0000	0.0000	0.0000	0.0000	119.1160	303.5925	473.9309	(98a)
Space heating requirement - total per year (kWh/year)												2061.3063	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	451.0641	322.2348	243.9978	114.3499	33.0204	0.0000	0.0000	0.0000	0.0000	119.1160	303.5925	473.9309	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2061.3063	
Space heating per m2										(98c) / (4) =		37.4103	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	451.0641	322.2348	243.9978	114.3499	33.0204	0.0000	0.0000	0.0000	0.0000	119.1160	303.5925	473.9309	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	451.0641	322.2348	243.9978	114.3499	33.0204	0.0000	0.0000	0.0000	0.0000	119.1160	303.5925	473.9309	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.6688	3.3137	3.6688	3.5504	3.6688	3.5504	3.6688	3.6688	3.5504	3.6688	3.5504	3.6688	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2061.3063	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2520)
mechanical ventilation fans (SFP = 0.2520) 43.1969 (230a)
Total electricity for the above, kWh/year 43.1969 (231)
Electricity for lighting (calculated in Appendix L) 132.9302 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2863.8511 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2061.3063	0.1564	322.4164	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			410.8232	(265)
Pumps, fans and electric keep-hot	43.1969	0.1387	5.9919	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			436.0011	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2061.3063	1.5790	3254.9025	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			4208.2238	(279)
Pumps, fans and electric keep-hot	43.1969	1.5128	65.3482	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			4477.4648	(286)
Dwelling Primary energy Rate (DPER)			81.2600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b) x	2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1423	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3923	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3335	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4252	0.4169	0.4085	0.3668	0.3585	0.3168	0.3168	0.3085	0.3335	0.3585	0.3752	0.3919	(22b)
Effective ac	0.5904	0.5869	0.5834	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.7100	1.1450	13.4084			(27)
Ground Floor			55.1000	0.1300	7.1630			(28a)
Brickwork	60.1800	11.7100	48.4700	0.1800	8.7246			(29a)
Communal Wall	19.9800	2.0600	17.9200	0.1800	3.2256			(29a)
Stairwell Wall	10.6200		10.6200	0.1800	1.9116			(29a)
Cycle Store Wall	16.0000		16.0000	0.1800	2.8800			(29a)
Total net area of external elements Aum(A, m2)			161.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.3732			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 395.2109 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	33.8900	0.1600	5.4224
E7 Party floor between dwellings (in blocks of flats)	33.8900	0.0700	2.3723
E16 Corner (normal)	22.0500	0.0900	1.9845
E17 Corner (inverted - internal area greater than external area)	9.4500	-0.0900	-0.8505
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0500	1.1700
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4557 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.8289 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3748	27.2120	27.0525	26.3032	26.1630	25.5103	25.5103	25.3895	25.7617	26.1630	26.4466	26.7431	(38)
Heat transfer coeff	77.2037	77.0409	76.8814	76.1321	75.9919	75.3392	75.3392	75.2183	75.5906	75.9919	76.2755	76.5720	(39)

Average = Sum(39)m / 12 = 76.1314

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4012	1.3982	1.3953	1.3817	1.3792	1.3673	1.3673	1.3651	1.3719	1.3792	1.3843	1.3897	(40)
HLP (average)												1.3817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)
Hot water usage for baths	23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)
Hot water usage for other uses	33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5439	198.6677	211.1098	185.5406	179.8522	162.0402	159.8182	166.1156	167.9022	187.2699	199.2117	222.0653	(62)
WWHRS	-25.1780	-22.2677	-23.3174	-19.3077	-17.9941	-15.3977	-14.4329	-15.3479	-15.9311	-18.7810	-21.2765	-24.7118	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
										Total per year (kWh/year) = Sum(64)m =		2030.1935	(64)
12Total per year (kWh/year)												2030	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	96.4440	85.7321	91.9771	82.7727	81.5840	74.9588	74.9227	77.0166	76.9079	84.0504	87.3183	95.6198	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0837	89.7712	81.0837	83.7865	81.0837	83.7865	81.0837	81.0837	83.7865	81.0837	83.7865	81.0837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)													

	129.6290	127.5775	123.6252	114.9621	109.6559	104.1094	100.7025	103.5169	106.8166	112.9709	121.2755	128.5213	(72)
Total internal gains	424.7603	433.0613	416.2259	401.3339	382.0502	365.6100	352.4211	353.5705	363.7685	379.1518	401.4338	416.5734	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1700	11.2829	0.6300	0.7000	0.7700	7.4826	(75)
Southeast	5.1900	36.7938	0.6300	0.7000	0.7700	58.3599	(77)
South	4.3500	46.7521	0.6300	0.7000	0.7700	62.1530	(78)

Solar gains	127.9954	216.4301	293.1196	360.1435	402.0570	398.9491	384.6845	353.1903	316.1618	238.2718	152.9892	109.7604	(83)
Total gains	552.7558	649.4914	709.3456	761.4774	784.1072	764.5591	737.1056	706.7608	679.9304	617.4235	554.4230	526.3339	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.3502	78.5157	78.6786	79.4530	79.5996	80.2892	80.2892	80.4182	80.0221	79.5996	79.3036	78.9965	
alpha	6.2233	6.2344	6.2452	6.2969	6.3066	6.3526	6.3526	6.3612	6.3348	6.3066	6.2869	6.2664	
util living area	0.9971	0.9915	0.9775	0.9304	0.8145	0.6178	0.4482	0.4869	0.7282	0.9448	0.9918	0.9978	(86)
MIT	20.0457	20.2287	20.4549	20.7243	20.9117	20.9872	20.9985	20.9975	20.9657	20.7317	20.3389	20.0146	(87)
Th 2	19.7624	19.7647	19.7669	19.7774	19.7793	19.7885	19.7885	19.7902	19.7850	19.7793	19.7754	19.7712	(88)
util rest of house	0.9955	0.9872	0.9660	0.8964	0.7394	0.5077	0.3257	0.3605	0.6189	0.9098	0.9868	0.9967	(89)
MIT 2	18.6950	18.9283	19.2113	19.5354	19.7224	19.7840	19.7883	19.7898	19.7701	19.5534	19.0778	18.6620	(90)
Living area fraction									fLA = Living area / (4) =			0.4436	(91)
MIT	19.2941	19.5051	19.7629	20.0627	20.2500	20.3177	20.3251	20.3255	20.3004	20.0761	19.6371	19.2619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2941	19.5051	19.7629	20.0627	20.2500	20.3177	20.3251	20.3255	20.3004	20.0761	19.6371	19.2619	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9860	0.9660	0.9055	0.7705	0.5569	0.3802	0.4168	0.6676	0.9199	0.9861	0.9960	(94)
Useful gains	549.8393	640.3911	685.2205	689.5217	604.1679	425.7774	280.2676	294.6003	453.9360	567.9943	546.7103	524.2295	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1157.6027	1125.1919	1019.6699	849.8421	649.7278	430.7646	280.6445	295.2683	468.6917	720.1048	956.2770	1153.3235	(97)
Space heating kWh	452.1759	325.7862	248.8303	115.4307	33.8966	0.0000	0.0000	0.0000	0.0000	113.1702	294.8880	468.0459	(98a)
Space heating requirement - total per year (kWh/year)												2052.2238	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	452.1759	325.7862	248.8303	115.4307	33.8966	0.0000	0.0000	0.0000	0.0000	113.1702	294.8880	468.0459	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2052.2238	
Space heating per m2											(98c) / (4) =	37.2454	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	452.1759	325.7862	248.8303	115.4307	33.8966	0.0000	0.0000	0.0000	0.0000	113.1702	294.8880	468.0459	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	489.8981	352.9644	269.5886	125.0603	36.7243	0.0000	0.0000	0.0000	0.0000	122.6113	319.4887	507.0920	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8377	85.4161	84.6918	83.2582	81.2255	79.8000	79.8000	79.8000	79.8000	83.1876	85.1845	85.9257	(217)
Fuel for water heating, kWh/month	232.2590	206.5184	221.7363	199.6595	199.2700	183.7625	182.1872	188.9319	190.4401	202.5408	208.8820	229.6791	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8476	13.5158	12.1694	8.9159	6.8869	5.6266	6.2824	8.1661	10.6070	13.9170	15.7192	17.3158	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.8811	-22.1118	-33.4853	-39.7433	-44.7180	-42.4424	-41.9421	-38.6754	-33.2313	-26.2084	-16.7629	-12.7381	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-5.2882	-11.3759	-23.0802	-35.3584	-47.4278	-47.8849	-47.3046	-39.7289	-28.7092	-16.4759	-7.1279	-4.1622 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2223.4277 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2445.8668 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	135.9697 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-680.8639 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4210.4004 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2223.4277	0.2100	466.9198	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2445.8668	0.2100	513.6320	(264)
Space and water heating			980.5519	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.9697	0.1443	19.6246	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9400	0.1335	-48.9792	
PV Unit electricity exported	-313.9239	0.1253	-39.3438	
Total			-88.3230	(269)
Total CO2, kg/year			923.7828	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.7700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2223.4277	1.1300	2512.4733	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2445.8668	1.1300	2763.8295	(278)
Space and water heating			5276.3029	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.9697	1.5338	208.5549	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9400	1.4933	-547.9356	
PV Unit electricity exported	-313.9239	0.4600	-144.4105	
Total			-692.3462	(283)
Total Primary energy kWh/year			4922.6124	(286)
Target Primary Energy Rate (TPER)			89.3400	(287)

Full SAP Calculation Printout

Plot Reference	P-32	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-32
Plot Address	Flat 1, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	7.91	**TER**	16.77
Environmental	95 A	**% DER < TER**			52.83
CO_2 Emissions (t/year)	0.37	**DFEE**	44.69	**TFEE**	46.22
Compliance Check	See BREL	**% DFEE < TFEE**			3.29
% DPER < TPER	9.04	**DPER**	81.26	**TPER**	89.34

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.5050	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1423 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.9300 (17)
Infiltration rate			0.2888 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2455 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3130	0.3069	0.3008	0.2701	0.2639	0.2332	0.2332	0.2271	0.2455	0.2639	0.2762	0.2885	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5490	0.5471	0.5452	0.5365	0.5348	0.5272	0.5272	0.5258	0.5301	0.5348	0.5381	0.5416	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.7100	1.1450	7.6832			(27)
Window			8.4300	1.1450	9.6527			(27)
Ground Floor			55.1000	0.1200	6.6120	110.0000	6061.0000	(28a)
Brickwork	60.1800	15.1400	45.0400	0.2100	9.4584	110.0000	4954.4000	(29a)
Communal Wall	19.9800	2.0600	17.9200	0.2200	3.9424	110.0000	1971.1999	(29a)
Stairwell Wall	10.6200		10.6200	0.1600	1.6992	110.0000	1168.2000	(29a)
Cycle Store Wall	16.0000		16.0000	0.2100	3.3600	110.0000	1760.0000	(29a)
Total net area of external elements Aum(A, m2)			161.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8799			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21776.1199	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							395.2109	(35)
List of Thermal Bridges								

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	33.8900	0.1120	3.7957	
E7 Party floor between dwellings (in blocks of flats)	33.8900	0.0380	1.2878	
E16 Corner (normal)	22.0500	0.0540	1.1907	
E17 Corner (inverted - internal area greater than external area)	9.4500	-0.0970	-0.9166	
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570	
E4 Jamb	23.4000	0.0160	0.3744	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.0890	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	50.9688	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.4551	25.3669	25.2804	24.8743	24.7983	24.4445	24.4445	24.3790	24.5808	24.7983	24.9520	25.1127	(38)
Heat transfer coeff	76.4239	76.3357	76.2492	75.8431	75.7671	75.4134	75.4134	75.3479	75.5496	75.7671	75.9208	76.0815	(39)
Average = Sum(39)m / 12 =												75.8427	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3870	1.3854	1.3838	1.3765	1.3751	1.3687	1.3687	1.3675	1.3711	1.3751	1.3779	1.3808	(40)
HLP (average)												1.3765	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy												1.8403	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)
Hot water usage for other uses	33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)
Average daily hot water use (litres/day)												52.5062	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.2837	55.7128	53.9976	51.8622	49.9575	47.9779	47.5662	49.2780	51.0336	53.0666	55.2208	57.2032	(44)
Energy conte	90.7234	79.3343	82.9923	70.9968	67.2524	58.9945	57.5272	61.0164	62.9295	72.0108	78.6722	89.5665	(45)
Energy content (annual)										Total = Sum(45)m =		872.0164	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(64)
										Total per year (kWh/year) = Sum(64)m =		741.2139	(64)
12Total per year (kWh/year)												741	(64)
Electric shower(s)	44.1060	39.2988	42.9128	40.9511	41.7196	39.7964	41.1230	41.7196	40.9511	42.9128	42.1059	44.1060	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		501.7031	(64a)
Heat gains from water heating, kWh/month	30.3052	26.6832	28.3641	25.3246	24.7210	22.4854	22.5053	23.3959	23.6103	26.0305	27.2443	30.0594	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9252	89.5958	80.9252	83.6227	80.9252	83.6227	80.9252	80.9252	83.6227	80.9252	83.6227	80.9252	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	40.7328	39.7072	38.1237	35.1731	33.2272	31.2298	30.2490	31.4461	32.7921	34.9872	37.8393	40.4024	(72)
Total internal gains	332.7057	342.0155	327.5660	318.3811	302.4631	292.5666	281.8091	281.3413	289.5803	298.0096	314.8339	325.2961	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.7100	36.7938	0.3300	0.0000	0.7700	62.7339	(77)
Northeast	2.8100	11.2829	0.3300	0.0000	0.7700	8.0563	(75)
South	5.6200	46.7521	0.3300	0.0000	0.7700	66.7639	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	137.5541	232.5999	315.0369	387.1015	432.1783	428.8487	413.5103	379.6379	339.8120	256.0782	164.4156	117.9564	(83)
Total gains	470.2598	574.6154	642.6029	705.4827	734.6413	721.4152	695.3195	660.9791	629.3923	554.0879	479.2495	443.2525	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.1496	79.2411	79.3309	79.7558	79.8357	80.2102	80.2102	80.2800	80.0656	79.8357	79.6741	79.5058	
alpha	6.2766	6.2827	6.2887	6.3171	6.3224	6.3473	6.3473	6.3520	6.3377	6.3224	6.3116	6.3004	
util living area	0.9988	0.9955	0.9859	0.9486	0.8448	0.6508	0.4749	0.5202	0.7707	0.9653	0.9962	0.9992	(86)
MIT	19.9555	20.1491	20.3885	20.6778	20.8910	20.9829	20.9979	20.9964	20.9530	20.6718	20.2509	19.9175	(87)
Th 2	19.7733	19.7745	19.7757	19.7814	19.7825	19.7874	19.7874	19.7884	19.7855	19.7825	19.7803	19.7781	(88)
util rest of house	0.9982	0.9931	0.9782	0.9210	0.7740	0.5371	0.3454	0.3857	0.6620	0.9405	0.9938	0.9987	(89)
MIT 2	18.8498	19.0430	19.2788	19.5539	19.7257	19.7826	19.7872	19.7879	19.7688	19.5560	19.1497	18.8158	(90)
Living area fraction										fLA = Living area / (4) =		0.4436	(91)
MIT	19.3402	19.5336	19.7710	20.0524	20.2426	20.3150	20.3242	20.3239	20.2941	20.0509	19.6382	19.3045	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3402	19.5336	19.7710	20.0524	20.2426	20.3150	20.3242	20.3239	20.2941	20.0509	19.6382	19.3045	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9925	0.9782	0.9282	0.8032	0.5881	0.4032	0.4458	0.7106	0.9472	0.9934	0.9985	(94)
Useful gains	469.2406	570.2976	628.5994	654.8508	590.0503	424.2397	280.3253	294.6713	447.2619	524.8464	476.0993	442.5784	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1149.4343	1117.0659	1011.9014	845.8318	647.2472	430.9892	280.8566	295.6601	467.9598	716.0694	951.9069	1149.1724	(97)
Space heating kWh	506.0641	367.4283	285.1767	137.5063	42.5545	0.0000	0.0000	0.0000	0.0000	142.2699	342.5815	525.7059	(98a)
Space heating requirement - total per year (kWh/year)												2349.2872	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	506.0641	367.4283	285.1767	137.5063	42.5545	0.0000	0.0000	0.0000	0.0000	142.2699	342.5815	525.7059	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2349.2872	
Space heating per m2											(98c) / (4) =	42.6368	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	708.8856	558.0589	572.6437	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9158	0.9639	0.9496	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	649.2138	537.9271	543.7764	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	813.9659	785.0615	746.4765	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	118.6215	183.8680	150.8089	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.6554	45.9670	37.7022	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												113.3246	(107)
Energy for space heating												42.6368	(99)
Energy for space cooling												2.0567	(108)
Total												44.6935	(109)
Fabric Energy Efficiency (DFEE)												44.7	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1423 (8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3923	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3335	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4252	0.4169	0.4085	0.3668	0.3585	0.3168	0.3168	0.3085	0.3335	0.3585	0.3752	0.3919	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5904	0.5869	0.5834	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.7100	1.1450	13.4084			(27)
Ground Floor			55.1000	0.1300	7.1630			(28a)
Brickwork	60.1800	11.7100	48.4700	0.1800	8.7246			(29a)
Communal Wall	19.9800	2.0600	17.9200	0.1800	3.2256			(29a)
Stairwell Wall	10.6200		10.6200	0.1800	1.9116			(29a)
Cycle Store Wall	16.0000		16.0000	0.1800	2.8800			(29a)
Total net area of external elements Aum(A, m2)			161.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.3732			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	395.2109	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	33.8900	0.1600	5.4224
E7 Party floor between dwellings (in blocks of flats)	33.8900	0.0700	2.3723
E16 Corner (normal)	22.0500	0.0900	1.9845
E17 Corner (inverted - internal area greater than external area)	9.4500	-0.0900	-0.8505
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0500	1.1700
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.4557	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	49.8289	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3748	27.2120	27.0525	26.3032	26.1630	25.5103	25.5103	25.3895	25.7617	26.1630	26.4466	26.7431	(38)
Heat transfer coeff	77.2037	77.0409	76.8814	76.1321	75.9919	75.3392	75.3392	75.2183	75.5906	75.9919	76.2755	76.5720	(39)
Average = Sum(39)m / 12 =												76.1314	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4012	1.3982	1.3953	1.3817	1.3792	1.3673	1.3673	1.3651	1.3719	1.3792	1.3843	1.3897	(40)
HLP (average)												1.3817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8403	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day)	52.5062	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.2837	55.7128	53.9976	51.8622	49.9575	47.9779	47.5662	49.2780	51.0336	53.0666	55.2208	57.2032	(44)
Energy conte	90.7234	79.3343	82.9923	70.9968	67.2524	58.9945	57.5272	61.0164	62.9295	72.0108	78.6722	89.5665	(45)
Energy content (annual)										Total = Sum(45)m =		872.0164	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(64)
									Total per year (kWh/year) = Sum(64)m =			741.2139	(64)
12Total per year (kWh/year)												741	(64)
Electric shower(s)	44.1060	39.2988	42.9128	40.9511	41.7196	39.7964	41.1230	41.7196	40.9511	42.9128	42.1059	44.1060	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							501.7031	(64a)
Heat gains from water heating, kWh/month	30.3052	26.6832	28.3641	25.3246	24.7210	22.4854	22.5053	23.3959	23.6103	26.0305	27.2443	30.0594	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.0837	89.7712	81.0837	83.7865	81.0837	83.7865	81.0837	81.0837	83.7865	81.0837	83.7865	81.0837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)													
	40.7328	39.7072	38.1237	35.1731	33.2272	31.2298	30.2490	31.4461	32.7921	34.9872	37.8393	40.4024	(72)
Total internal gains													
	332.8642	342.1910	327.7245	318.5449	302.6215	292.7303	281.9676	281.4997	289.7441	298.1681	314.9977	325.4545	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1700	11.2829	0.6300	0.7000	0.7700	7.4826	(75)
Southeast	5.1900	36.7938	0.6300	0.7000	0.7700	58.3599	(77)
South	4.3500	46.7521	0.6300	0.7000	0.7700	62.1530	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	127.9954	216.4301	293.1196	360.1435	402.0570	398.9491	384.6845	353.1903	316.1618	238.2718	152.9892	109.7604	(83)
Total gains	460.8596	558.6211	620.8441	678.6884	704.6786	691.6794	666.6521	634.6900	605.9059	536.4398	467.9869	435.2150	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.3502	78.5157	78.6786	79.4530	79.5996	80.2892	80.2892	80.4182	80.0221	79.5996	79.3036	78.9965	
alpha	6.2233	6.2344	6.2452	6.2969	6.3066	6.3526	6.3526	6.3612	6.3348	6.3066	6.2869	6.2664	
util living area													
	0.9989	0.9962	0.9884	0.9569	0.8644	0.6741	0.4943	0.5399	0.7913	0.9704	0.9967	0.9993	(86)
MIT	19.9284	20.1156	20.3517	20.6479	20.8735	20.9794	20.9974	20.9956	20.9454	20.6503	20.2308	19.8977	(87)
Th 2	19.7624	19.7647	19.7669	19.7774	19.7793	19.7885	19.7885	19.7902	19.7850	19.7793	19.7754	19.7712	(88)
util rest of house													
	0.9984	0.9941	0.9819	0.9327	0.7972	0.5585	0.3600	0.4010	0.6838	0.9483	0.9946	0.9989	(89)
MIT 2	18.8140	19.0019	19.2360	19.5246	19.7117	19.7825	19.7882	19.7896	19.7650	19.5346	19.1259	18.7905	(90)
Living area fraction									fLA = Living area / (4) =			0.4436	(91)
MIT	19.3083	19.4959	19.7309	20.0228	20.2270	20.3134	20.3245	20.3245	20.2885	20.0295	19.6160	19.2816	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3083	19.4959	19.7309	20.0228	20.2270	20.3134	20.3245	20.3245	20.2885	20.0295	19.6160	19.2816	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9935	0.9816	0.9385	0.8244	0.6104	0.4199	0.4632	0.7319	0.9540	0.9942	0.9986	(94)
Useful gains	459.9641	555.0118	609.4461	636.9424	580.9429	422.2021	279.9373	293.9803	443.4325	511.7403	465.2735	434.6154	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1158.6964	1124.4818	1017.2089	846.8029	647.9818	430.4427	280.6045	295.1969	467.7947	716.5632	954.6642	1154.8269	(97)
Space heating kWh													
	519.8568	382.6838	303.3755	151.0995	49.8769	0.0000	0.0000	0.0000	0.0000	152.3883	352.3613	535.8374	(98a)
Space heating requirement - total per year (kWh/year)												2447.4795	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	519.8568	382.6838	303.3755	151.0995	49.8769	0.0000	0.0000	0.0000	0.0000	152.3883	352.3613	535.8374	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2447.4795	
Space heating per m2											(98c) / (4) =	44.4189	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	708.1886	557.5101	571.6594	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9015	0.9564	0.9404	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	638.4464	533.1956	537.5752	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	779.0322	751.3839	715.5832	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	101.2218	162.3321	132.4380	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	25.3055	40.5830	33.1095	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												98.9980	(107)
Energy for space heating												44.4189	(99)
Energy for space cooling												1.7967	(108)
Total												46.2156	(109)
Fabric Energy Efficiency (TFEE)												46.2	(109)

Full SAP Calculation Printout

Plot Reference	P-32	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-32
Plot Address	Flat 1, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	7.91	**TER**	16.77
Environmental	95 A	**% DER < TER**			52.83
CO_2 Emissions (t/year)	0.37	**DFEE**	44.69	**TFEE**	46.22
Compliance Check	See BREL	**% DFEE < TFEE**			3.29
% DPER < TPER	9.04	**DPER**	81.26	**TPER**	89.34

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.5050	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9300 (17)
Infiltration rate		0.1465 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1245 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1588	0.1557	0.1525	0.1370	0.1339	0.1183	0.1183	0.1152	0.1245	0.1339	0.1401	0.1463	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.7100	1.1450	7.6832			(27)
Window			8.4300	1.1450	9.6527			(27)
Ground Floor			55.1000	0.1200	6.6120	110.0000	6061.0000	(28a)
Brickwork	60.1800	15.1400	45.0400	0.2100	9.4584	110.0000	4954.4000	(29a)
Communal Wall	19.9800	2.0600	17.9200	0.2200	3.9424	110.0000	1971.1999	(29a)
Stairwell Wall	10.6200		10.6200	0.1600	1.6992	110.0000	1168.2000	(29a)
Cycle Store Wall	16.0000		16.0000	0.2100	3.3600	110.0000	1760.0000	(29a)
Total net area of external elements Aum(A, m2)			161.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.8799			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21776.1199	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 395.2109 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	33.8900	0.1120	3.7957
E7 Party floor between dwellings (in blocks of flats)	33.8900	0.0380	1.2878
E16 Corner (normal)	22.0500	0.0540	1.1907
E17 Corner (inverted - internal area greater than external area)	9.4500	-0.0970	-0.9166
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0890 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.9688 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	(39)
Average = Sum(39)m / 12 =												74.1522	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	(40)
HLP (average)												1.3458	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)
Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
										Total per year (kWh/year) = Sum(64)m =		2032.8510	(64)
12Total per year (kWh/year)												2033	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9252	89.5958	80.9252	83.6227	80.9252	83.6227	80.9252	80.9252	83.6227	80.9252	83.6227	80.9252	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains	371.4998	379.7838	362.9654	348.0681	328.7897	315.3442	302.1606	303.3100	313.5027	325.8913	348.1680	363.3129	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.7100	36.7938	0.3300	0.0000	0.7700	62.7339	(77)
Northeast	2.8100	11.2829	0.3300	0.0000	0.7700	8.0563	(75)
South	5.6200	46.7521	0.3300	0.0000	0.7700	66.7639	(78)

Solar gains	137.5541	232.5999	315.0369	387.1015	432.1783	428.8487	413.5103	379.6379	339.8120	256.0782	164.4156	117.9564	(83)
Total gains	509.0538	612.3836	678.0023	735.1696	760.9680	744.1928	715.6709	682.9479	653.3147	581.9695	512.5836	481.2694	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	
alpha	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	
util living area	0.9981	0.9933	0.9804	0.9352	0.8194	0.6245	0.4543	0.4966	0.7411	0.9543	0.9944	0.9987	(86)
MIT	20.0496	20.2379	20.4657	20.7271	20.9140	20.9872	20.9985	20.9974	20.9643	20.7191	20.3219	20.0042	(87)
Th 2	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	(88)
util rest of house	0.9971	0.9899	0.9702	0.9031	0.7459	0.5150	0.3319	0.3693	0.6331	0.9240	0.9908	0.9979	(89)
MIT 2	18.7327	18.9717	19.2561	19.5634	19.7493	19.8006	19.8049	19.8047	19.7894	19.5632	19.0800	18.6747	(90)
Living area fraction										fLA = Living area / (4) =		0.4436	(91)
MIT	19.3168	19.5334	19.7926	20.0796	20.2659	20.3269	20.3344	20.3338	20.3105	20.0760	19.6308	19.2644	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3168	19.5334	19.7926	20.0796	20.2659	20.3269	20.3344	20.3338	20.3105	20.0760	19.6308	19.2644	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9889	0.9701	0.9116	0.7764	0.5639	0.3864	0.4261	0.6813	0.9323	0.9901	0.9975	(94)
Useful gains	507.2587	605.5791	657.7224	670.1698	590.7999	419.6630	276.5347	290.9964	445.0727	542.5602	507.5329	480.0558	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1113.5276	1085.0951	985.6764	828.9890	635.1821	424.6631	276.9108	291.6965	460.5216	702.6623	929.1892	1117.0597	(97)
Space heating kWh	451.0641	322.2348	243.9978	114.3499	33.0204	0.0000	0.0000	0.0000	0.0000	119.1160	303.5925	473.9309	(98a)
Space heating requirement - total per year (kWh/year)												2061.3063	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	451.0641	322.2348	243.9978	114.3499	33.0204	0.0000	0.0000	0.0000	0.0000	119.1160	303.5925	473.9309	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2061.3063	
Space heating per m2										(98c) / (4) =		37.4103	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	451.0641	322.2348	243.9978	114.3499	33.0204	0.0000	0.0000	0.0000	0.0000	119.1160	303.5925	473.9309	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	451.0641	322.2348	243.9978	114.3499	33.0204	0.0000	0.0000	0.0000	0.0000	119.1160	303.5925	473.9309	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.6688	3.3137	3.6688	3.5504	3.6688	3.5504	3.6688	3.6688	3.5504	3.6688	3.5504	3.6688	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2061.3063	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2520)
mechanical ventilation fans (SFP = 0.2520) 43.1969 (230a)
Total electricity for the above, kWh/year 43.1969 (231)
Electricity for lighting (calculated in Appendix L) 132.9302 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2863.8511 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2061.3063	0.1564	322.4164	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			410.8232	(265)
Pumps, fans and electric keep-hot	43.1969	0.1387	5.9919	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			436.0011	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2061.3063	1.5790	3254.9025	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			4208.2238	(279)
Pumps, fans and electric keep-hot	43.1969	1.5128	65.3482	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			4477.4648	(286)
Dwelling Primary energy Rate (DPER)			81.2600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b) x	2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1423	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3923	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3335	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4252	0.4169	0.4085	0.3668	0.3585	0.3168	0.3168	0.3085	0.3335	0.3585	0.3752	0.3919	(22b)
Effective ac	0.5904	0.5869	0.5834	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.7100	1.1450	13.4084			(27)
Ground Floor			55.1000	0.1300	7.1630			(28a)
Brickwork	60.1800	11.7100	48.4700	0.1800	8.7246			(29a)
Communal Wall	19.9800	2.0600	17.9200	0.1800	3.2256			(29a)
Stairwell Wall	10.6200		10.6200	0.1800	1.9116			(29a)
Cycle Store Wall	16.0000		16.0000	0.1800	2.8800			(29a)
Total net area of external elements Aum(A, m2)			161.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.3732			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 395.2109 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	33.8900	0.1600	5.4224
E7 Party floor between dwellings (in blocks of flats)	33.8900	0.0700	2.3723
E16 Corner (normal)	22.0500	0.0900	1.9845
E17 Corner (inverted - internal area greater than external area)	9.4500	-0.0900	-0.8505
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0500	1.1700
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4557 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.8289 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3748	27.2120	27.0525	26.3032	26.1630	25.5103	25.5103	25.3895	25.7617	26.1630	26.4466	26.7431	(38)
Heat transfer coeff	77.2037	77.0409	76.8814	76.1321	75.9919	75.3392	75.3392	75.2183	75.5906	75.9919	76.2755	76.5720	(39)

Average = Sum(39)m / 12 = 76.1314

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4012	1.3982	1.3953	1.3817	1.3792	1.3673	1.3673	1.3651	1.3719	1.3792	1.3843	1.3897	(40)
HLP (average)												1.3817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)
Hot water usage for baths	23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)
Hot water usage for other uses	33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5439	198.6677	211.1098	185.5406	179.8522	162.0402	159.8182	166.1156	167.9022	187.2699	199.2117	222.0653	(62)
WWHRS	-25.1780	-22.2677	-23.3174	-19.3077	-17.9941	-15.3977	-14.4329	-15.3479	-15.9311	-18.7810	-21.2765	-24.7118	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
										Total per year (kWh/year) = Sum(64)m =		2030.1935	(64)
12Total per year (kWh/year)												2030	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	96.4440	85.7321	91.9771	82.7727	81.5840	74.9588	74.9227	77.0166	76.9079	84.0504	87.3183	95.6198	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.0837	89.7712	81.0837	83.7865	81.0837	83.7865	81.0837	81.0837	83.7865	81.0837	83.7865	81.0837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)													

	129.6290	127.5775	123.6252	114.9621	109.6559	104.1094	100.7025	103.5169	106.8166	112.9709	121.2755	128.5213	(72)
Total internal gains	424.7603	433.0613	416.2259	401.3339	382.0502	365.6100	352.4211	353.5705	363.7685	379.1518	401.4338	416.5734	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1700	11.2829	0.6300	0.7000	0.7700	7.4826	(75)
Southeast	5.1900	36.7938	0.6300	0.7000	0.7700	58.3599	(77)
South	4.3500	46.7521	0.6300	0.7000	0.7700	62.1530	(78)

Solar gains	127.9954	216.4301	293.1196	360.1435	402.0570	398.9491	384.6845	353.1903	316.1618	238.2718	152.9892	109.7604	(83)
Total gains	552.7558	649.4914	709.3456	761.4774	784.1072	764.5591	737.1056	706.7608	679.9304	617.4235	554.4230	526.3339	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.3502	78.5157	78.6786	79.4530	79.5996	80.2892	80.2892	80.4182	80.0221	79.5996	79.3036	78.9965	
alpha	6.2233	6.2344	6.2452	6.2969	6.3066	6.3526	6.3526	6.3612	6.3348	6.3066	6.2869	6.2664	
util living area	0.9971	0.9915	0.9775	0.9304	0.8145	0.6178	0.4482	0.4869	0.7282	0.9448	0.9918	0.9978	(86)
MIT	20.0457	20.2287	20.4549	20.7243	20.9117	20.9872	20.9985	20.9975	20.9657	20.7317	20.3389	20.0146	(87)
Th 2	19.7624	19.7647	19.7669	19.7774	19.7793	19.7885	19.7885	19.7902	19.7850	19.7793	19.7754	19.7712	(88)
util rest of house	0.9955	0.9872	0.9660	0.8964	0.7394	0.5077	0.3257	0.3605	0.6189	0.9098	0.9868	0.9967	(89)
MIT 2	18.6950	18.9283	19.2113	19.5354	19.7224	19.7840	19.7883	19.7898	19.7701	19.5534	19.0778	18.6620	(90)
Living area fraction									fLA = Living area / (4) =			0.4436	(91)
MIT	19.2941	19.5051	19.7629	20.0627	20.2500	20.3177	20.3251	20.3255	20.3004	20.0761	19.6371	19.2619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2941	19.5051	19.7629	20.0627	20.2500	20.3177	20.3251	20.3255	20.3004	20.0761	19.6371	19.2619	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9860	0.9660	0.9055	0.7705	0.5569	0.3802	0.4168	0.6676	0.9199	0.9861	0.9960	(94)
Useful gains	549.8393	640.3911	685.2205	689.5217	604.1679	425.7774	280.2676	294.6003	453.9360	567.9943	546.7103	524.2295	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1157.6027	1125.1919	1019.6699	849.8421	649.7278	430.7646	280.6445	295.2683	468.6917	720.1048	956.2770	1153.3235	(97)
Space heating kWh	452.1759	325.7862	248.8303	115.4307	33.8966	0.0000	0.0000	0.0000	0.0000	113.1702	294.8880	468.0459	(98a)
Space heating requirement - total per year (kWh/year)												2052.2238	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	452.1759	325.7862	248.8303	115.4307	33.8966	0.0000	0.0000	0.0000	0.0000	113.1702	294.8880	468.0459	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2052.2238	
Space heating per m2											(98c) / (4) =	37.2454	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	452.1759	325.7862	248.8303	115.4307	33.8966	0.0000	0.0000	0.0000	0.0000	113.1702	294.8880	468.0459	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	489.8981	352.9644	269.5886	125.0603	36.7243	0.0000	0.0000	0.0000	0.0000	122.6113	319.4887	507.0920	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8377	85.4161	84.6918	83.2582	81.2255	79.8000	79.8000	79.8000	79.8000	83.1876	85.1845	85.9257	(217)
Fuel for water heating, kWh/month	232.2590	206.5184	221.7363	199.6595	199.2700	183.7625	182.1872	188.9319	190.4401	202.5408	208.8820	229.6791	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8476	13.5158	12.1694	8.9159	6.8869	5.6266	6.2824	8.1661	10.6070	13.9170	15.7192	17.3158	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.8811	-22.1118	-33.4853	-39.7433	-44.7180	-42.4424	-41.9421	-38.6754	-33.2313	-26.2084	-16.7629	-12.7381	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-5.2882	-11.3759	-23.0802	-35.3584	-47.4278	-47.8849	-47.3046	-39.7289	-28.7092	-16.4759	-7.1279	-4.1622 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2223.4277 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2445.8668 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	135.9697 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-680.8639 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4210.4004 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2223.4277	0.2100	466.9198	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2445.8668	0.2100	513.6320	(264)
Space and water heating			980.5519	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.9697	0.1443	19.6246	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9400	0.1335	-48.9792	
PV Unit electricity exported	-313.9239	0.1253	-39.3438	
Total			-88.3230	(269)
Total CO2, kg/year			923.7828	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.7700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2223.4277	1.1300	2512.4733	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2445.8668	1.1300	2763.8295	(278)
Space and water heating			5276.3029	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.9697	1.5338	208.5549	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9400	1.4933	-547.9356	
PV Unit electricity exported	-313.9239	0.4600	-144.4105	
Total			-692.3462	(283)
Total Primary energy kWh/year			4922.6124	(286)
Target Primary Energy Rate (TPER)			89.3400	(287)

Full SAP Calculation Printout

Plot Reference	P-32	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-32
Plot Address	Flat 1, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	7.91	**TER**	16.77
Environmental	95 A	**% DER < TER**			52.83
CO_2 Emissions (t/year)	0.37	**DFEE**	44.69	**TFEE**	46.22
Compliance Check	See BREL	**% DFEE < TFEE**			3.29
% DPER < TPER	9.04	**DPER**	81.26	**TPER**	89.34

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9300 (17)
Infiltration rate		0.1465 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1245 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1588	0.1557	0.1525	0.1370	0.1339	0.1183	0.1183	0.1152	0.1245	0.1339	0.1401	0.1463	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.7100	1.1450	7.6832			(27)
Window			8.4300	1.1450	9.6527			(27)
Ground Floor			55.1000	0.1200	6.6120	110.0000	6061.0000	(28a)
Brickwork	60.1800	15.1400	45.0400	0.2100	9.4584	110.0000	4954.4000	(29a)
Communal Wall	19.9800	2.0600	17.9200	0.2200	3.9424	110.0000	1971.1999	(29a)
Stairwell Wall	10.6200		10.6200	0.1600	1.6992	110.0000	1168.2000	(29a)
Cycle Store Wall	16.0000		16.0000	0.2100	3.3600	110.0000	1760.0000	(29a)
Total net area of external elements Aum(A, m2)			161.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.8799			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21776.1199	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 395.2109 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	33.8900	0.1120	3.7957
E7	Party floor between dwellings (in blocks of flats)	33.8900	0.0380	1.2878
E16	Corner (normal)	22.0500	0.0540	1.1907
E17	Corner (inverted - internal area greater than external area)	9.4500	-0.0970	-0.9166
E2	Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4	Jamb	23.4000	0.0160	0.3744
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0890 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 50.9688 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	(39)

Average = Sum(39)m / 12 = 74.1522

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	(40)
HLP (average)												1.3458	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)

Total per year (kWh/year) = Sum(64)m = 2032.8510 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.7100	36.7938	0.3300	0.0000	0.7700	62.7339	(77)
Northeast	2.8100	11.2829	0.3300	0.0000	0.7700	8.0563	(75)
South	5.6200	46.7521	0.3300	0.0000	0.7700	66.7639	(78)

Solar gains	137.5541	232.5999	315.0369	387.1015	432.1783	428.8487	413.5103	379.6379	339.8120	256.0782	164.4156	117.9564	(83)

Total gains	560.0541	653.4293	722.5309	769.2995	789.6439	763.7539	734.9657	703.5267	676.3836	615.4372	551.5052	529.3058	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	
alpha	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	
util living area													
	0.9967	0.9905	0.9732	0.9223	0.8005	0.6100	0.4426	0.4825	0.7215	0.9419	0.9916	0.9977	(86)
MIT	20.1148	20.2886	20.5158	20.7557	20.9251	20.9887	20.9987	20.9978	20.9693	20.7508	20.3703	20.0660	(87)
Th 2	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	(88)
util rest of house													
	0.9950	0.9859	0.9600	0.8861	0.7250	0.5023	0.3232	0.3586	0.6137	0.9060	0.9866	0.9965	(89)
MIT 2	18.8157	19.0352	19.3159	19.5932	19.7575	19.8012	19.8050	19.8048	19.7918	19.5964	19.1404	18.7535	(90)
Living area fraction										fLA = Living area / (4) =		0.4436	(91)
MIT	19.3919	19.5911	19.8481	20.1088	20.2754	20.3279	20.3345	20.3340	20.3141	20.1084	19.6860	19.3356	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3919	19.5911	19.8481	20.1088	20.2754	20.3279	20.3345	20.3340	20.3141	20.1084	19.6860	19.3356	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9942	0.9848	0.9606	0.8966	0.7567	0.5504	0.3763	0.4138	0.6618	0.9167	0.9859	0.9958	(94)
Useful gains	556.7901	643.4733	694.0766	689.7508	597.5153	420.3711	276.5967	291.1212	447.6217	564.1973	543.7210	527.0840	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1119.0970	1089.3795	989.7939	831.1578	635.8869	424.7390	276.9188	291.7120	460.7887	705.0689	933.2756	1122.3404	(97)
Space heating kWh													
	418.3563	299.6489	220.0136	101.8131	28.5484	0.0000	0.0000	0.0000	0.0000	104.8084	280.4793	442.8707	(98a)
Space heating requirement - total per year (kWh/year)												1896.5388	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	418.3563	299.6489	220.0136	101.8131	28.5484	0.0000	0.0000	0.0000	0.0000	104.8084	280.4793	442.8707	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1896.5388	
Space heating per m2											(98c) / (4) =	34.4199	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	418.3563	299.6489	220.0136	101.8131	28.5484	0.0000	0.0000	0.0000	0.0000	104.8084	280.4793	442.8707	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	418.3563	299.6489	220.0136	101.8131	28.5484	0.0000	0.0000	0.0000	0.0000	104.8084	280.4793	442.8707	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.6688	3.3137	3.6688	3.5504	3.6688	3.5504	3.6688	3.6688	3.5504	3.6688	3.5504	3.6688	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1896.5388	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2520)		
mechanical ventilation fans (SFP = 0.2520)	43.1969	(230a)
Total electricity for the above, kWh/year	43.1969	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2699.0837	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1896.5388	16.4900	312.7393	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	16.4900	103.2963	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	43.1969	16.4900	7.1232	(249)
Energy for lighting	132.9302	16.4900	21.9202	(250)
Additional standing charges			0.0000	(251)
Total energy cost			445.0789	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6007	(257)
SAP value		74.0529	
SAP rating (Section 12)		74	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1896.5388	0.1566	296.9199	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			385.3267	(265)
Pumps, fans and electric keep-hot	43.1969	0.1387	5.9919	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			410.5046	(272)
CO2 emissions per m2			7.4500	(273)
EI value			94.5047	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000 (1b)	x	2.5500 (2b)	=	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9300	(17)
Infiltration rate		0.1465	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1245 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1339	0.1276	0.1276	0.1183	0.1214	0.1058	0.1058	0.1027	0.1058	0.1183	0.1152	0.1245	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.7100	1.1450	7.6832			(27)
Window			8.4300	1.1450	9.6527			(27)
Ground Floor			55.1000	0.1200	6.6120	110.0000	6061.0000	(28a)
Brickwork	60.1800	15.1400	45.0400	0.2100	9.4584	110.0000	4954.4000	(29a)
Communal Wall	19.9800	2.0600	17.9200	0.2200	3.9424	110.0000	1971.1999	(29a)
Stairwell Wall	10.6200		10.6200	0.1600	1.6992	110.0000	1168.2000	(29a)
Cycle Store Wall	16.0000		16.0000	0.2100	3.3600	110.0000	1760.0000	(29a)
Total net area of external elements Aum(A, m2)			161.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8799			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21776.1199 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 395.2109 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	33.8900	0.1120	3.7957
E7 Party floor between dwellings (in blocks of flats)	33.8900	0.0380	1.2878
E16 Corner (normal)	22.0500	0.0540	1.1907
E17 Corner (inverted - internal area greater than external area)	9.4500	-0.0970	-0.9166
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0890 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.9688 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	(39)

Average = Sum(39)m / 12 = 74.1522

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	(40)
HLP (average)												1.3458	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)
Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)

Total per year (kWh/year) = Sum(64)m = 2032.8510 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)

Water heating gains (Table 5)

	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)

Total internal gains

	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.7100	43.0593	0.3300	0.0000	0.7700	73.4165	(77)
Northeast	2.8100	13.7804	0.3300	0.0000	0.7700	9.8395	(75)
South	5.6200	54.2217	0.3300	0.0000	0.7700	77.4309	(78)

Solar gains	160.6869	237.3352	319.7684	401.4112	439.5519	462.8310	441.2707	413.0335	368.4388	280.5382	189.1602	138.6343	(83)
Total gains	583.1869	658.1647	727.2625	783.6091	797.0175	797.7363	762.7261	736.9223	705.0104	639.8972	576.2498	549.9837	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	
alpha	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	
util living area	0.9945	0.9872	0.9627	0.8859	0.7194	0.4810	0.3207	0.3419	0.6186	0.9034	0.9850	0.9961	(86)
MIT	20.2204	20.3690	20.5987	20.8322	20.9645	20.9976	20.9999	20.9998	20.9886	20.8355	20.4841	20.1785	(87)
Th 2	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	(88)
util rest of house	0.9916	0.9806	0.9441	0.8360	0.6286	0.3719	0.2047	0.2219	0.5023	0.8484	0.9758	0.9939	(89)
MIT 2	18.9499	19.1362	19.4156	19.6725	19.7868	19.8046	19.8051	19.8051	19.8015	19.6833	19.2823	18.8970	(90)
Living area fraction									fLA = Living area / (4) =			0.4436	(91)
MIT	19.5134	19.6831	19.9404	20.1869	20.3092	20.3338	20.3351	20.3350	20.3280	20.1944	19.8154	19.4654	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5134	19.6831	19.9404	20.1869	20.3092	20.3338	20.3351	20.3350	20.3280	20.1944	19.8154	19.4654	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9797	0.9467	0.8536	0.6685	0.4205	0.2562	0.2752	0.5544	0.8688	0.9759	0.9931	(94)
Useful gains	577.7643	644.8269	688.4653	668.9133	532.8050	335.4411	195.3733	202.7722	390.8554	555.9298	562.3451	546.1842	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1068.7879	1036.8736	929.8988	762.7969	549.4050	336.1884	195.3959	202.8085	395.0858	644.7077	876.1356	1065.2273	(97)
Space heating kWh	365.3215	263.4554	179.6265	67.5961	12.3504	0.0000	0.0000	0.0000	0.0000	66.0508	225.9292	386.1681	(98a)
Space heating requirement - total per year (kWh/year)												1566.4980	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	365.3215	263.4554	179.6265	67.5961	12.3504	0.0000	0.0000	0.0000	0.0000	66.0508	225.9292	386.1681	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1566.4980	
Space heating per m2											(98c) / (4) =	28.4301	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	365.3215	263.4554	179.6265	67.5961	12.3504	0.0000	0.0000	0.0000	0.0000	66.0508	225.9292	386.1681	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	365.3215	263.4554	179.6265	67.5961	12.3504	0.0000	0.0000	0.0000	0.0000	66.0508	225.9292	386.1681	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.6688	3.3137	3.6688	3.5504	3.6688	3.5504	3.6688	3.6688	3.5504	3.6688	3.5504	3.6688	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1566.4980	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	626.4178	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2520)		
mechanical ventilation fans (SFP = 0.2520)	43.1969	(230a)
Total electricity for the above, kWh/year	43.1969	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2369.0429	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1566.4980	27.6700	433.4500	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	27.6700	173.3298	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	43.1969	27.6700	11.9526	(249)
Energy for lighting	132.9302	27.6700	36.7818	(250)
Additional standing charges			0.0000	(251)
Total energy cost			655.5142	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1566.4980	0.1574	246.5232	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			334.9301	(265)
Pumps, fans and electric keep-hot	43.1969	0.1387	5.9919	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			360.1079	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1566.4980	1.5826	2479.1227	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			3432.4440	(279)
Pumps, fans and electric keep-hot	43.1969	1.5128	65.3482	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			3701.6850	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 74
Current environmental impact rating: A 95

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: C 74
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£656	£656	£0
Space heating	£445	£445	£0
Water heating	£173	£173	£0
Lighting	£37	£37	£0
Total cost of fuels	£656	£656	£0
Total cost of uses	£655	£655	£0
Delivered energy	43 kWh/m²	43 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	67 kWh/m²	67 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9300 (17)
Infiltration rate		0.1465 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1245 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1588	0.1557	0.1525	0.1370	0.1339	0.1183	0.1183	0.1152	0.1245	0.1339	0.1401	0.1463	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.7100	1.1450	7.6832			(27)
Window			8.4300	1.1450	9.6527			(27)
Ground Floor			55.1000	0.1200	6.6120	110.0000	6061.0000	(28a)
Brickwork	60.1800	15.1400	45.0400	0.2100	9.4584	110.0000	4954.4000	(29a)
Communal Wall	19.9800	2.0600	17.9200	0.2200	3.9424	110.0000	1971.1999	(29a)
Stairwell Wall	10.6200		10.6200	0.1600	1.6992	110.0000	1168.2000	(29a)
Cycle Store Wall	16.0000		16.0000	0.2100	3.3600	110.0000	1760.0000	(29a)
Total net area of external elements Aum(A, m2)			161.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.8799			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21776.1199 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 395.2109 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	33.8900	0.1120	3.7957
E7 Party floor between dwellings (in blocks of flats)	33.8900	0.0380	1.2878
E16 Corner (normal)	22.0500	0.0540	1.1907
E17 Corner (inverted - internal area greater than external area)	9.4500	-0.0970	-0.9166
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0890 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.9688 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	(39)
Average = Sum(39)m / 12 =												74.1522	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	(40)
HLP (average)												1.3458	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)
Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
										Total per year (kWh/year) = Sum(64)m =		2032.8510	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)

Water heating gains (Table 5)

	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192 (72)
Total internal gains												
	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.7100	36.7938	0.3300	0.0000	0.7700	62.7339	(77)
Northeast	2.8100	11.2829	0.3300	0.0000	0.7700	8.0563	(75)
South	5.6200	46.7521	0.3300	0.0000	0.7700	66.7639	(78)

Solar gains	137.5541	232.5999	315.0369	387.1015	432.1783	428.8487	413.5103	379.6379	339.8120	256.0782	164.4156	117.9564	(83)
Total gains	560.0541	653.4293	722.5309	769.2995	789.6439	763.7539	734.9657	703.5267	676.3836	615.4372	551.5052	529.3058	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	
alpha	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	
util living area	0.9967	0.9905	0.9732	0.9223	0.8005	0.6100	0.4426	0.4825	0.7215	0.9419	0.9916	0.9977	(86)
MIT	20.1148	20.2886	20.5158	20.7557	20.9251	20.9887	20.9987	20.9978	20.9693	20.7508	20.3703	20.0660	(87)
Th 2	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	(88)
util rest of house	0.9950	0.9859	0.9600	0.8861	0.7250	0.5023	0.3232	0.3586	0.6137	0.9060	0.9866	0.9965	(89)
MIT 2	18.8157	19.0352	19.3159	19.5932	19.7575	19.8012	19.8050	19.8048	19.7918	19.5964	19.1404	18.7535	(90)
Living area fraction									fLA = Living area / (4) =			0.4436	(91)
MIT	19.3919	19.5911	19.8481	20.1088	20.2754	20.3279	20.3345	20.3340	20.3141	20.1084	19.6860	19.3356	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3919	19.5911	19.8481	20.1088	20.2754	20.3279	20.3345	20.3340	20.3141	20.1084	19.6860	19.3356	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9942	0.9848	0.9606	0.8966	0.7567	0.5504	0.3763	0.4138	0.6618	0.9167	0.9859	0.9958	(94)
Useful gains	556.7901	643.4733	694.0766	689.7508	597.5153	420.3711	276.5967	291.1212	447.6217	564.1973	543.7210	527.0840	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1119.0970	1089.3795	989.7939	831.1578	635.8869	424.7390	276.9188	291.7120	460.7887	705.0689	933.2756	1122.3404	(97)
Space heating kWh	418.3563	299.6489	220.0136	101.8131	28.5484	0.0000	0.0000	0.0000	0.0000	104.8084	280.4793	442.8707	(98a)
Space heating requirement - total per year (kWh/year)												1896.5388	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	418.3563	299.6489	220.0136	101.8131	28.5484	0.0000	0.0000	0.0000	0.0000	104.8084	280.4793	442.8707	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1896.5388	
Space heating per m2											(98c) / (4) =	34.4199	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	418.3563	299.6489	220.0136	101.8131	28.5484	0.0000	0.0000	0.0000	0.0000	104.8084	280.4793	442.8707	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	418.3563	299.6489	220.0136	101.8131	28.5484	0.0000	0.0000	0.0000	0.0000	104.8084	280.4793	442.8707	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.6688	3.3137	3.6688	3.5504	3.6688	3.5504	3.6688	3.6688	3.5504	3.6688	3.5504	3.6688	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1896.5388	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	626.4178	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2520)		
mechanical ventilation fans (SFP = 0.2520)	43.1969	(230a)
Total electricity for the above, kWh/year	43.1969	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2699.0837	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1896.5388	16.4900	312.7393	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	16.4900	103.2963	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	43.1969	16.4900	7.1232	(249)
Energy for lighting	132.9302	16.4900	21.9202	(250)
Additional standing charges			0.0000	(251)
Total energy cost			445.0789	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6007	(257)
SAP value		74.0529	
SAP rating (Section 12)		74	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1896.5388	0.1566	296.9199	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			385.3267	(265)
Pumps, fans and electric keep-hot	43.1969	0.1387	5.9919	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			410.5046	(272)
CO2 emissions per m2			7.4500	(273)
EI value			94.5047	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9300	(17)
Infiltration rate		0.1465	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1245	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1339	0.1276	0.1276	0.1183	0.1214	0.1058	0.1058	0.1027	0.1058	0.1183	0.1152	0.1245	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			6.7100	1.1450	7.6832			(27)
Window			8.4300	1.1450	9.6527			(27)
Ground Floor			55.1000	0.1200	6.6120	110.0000	6061.0000	(28a)
Brickwork	60.1800	15.1400	45.0400	0.2100	9.4584	110.0000	4954.4000	(29a)
Communal Wall	19.9800	2.0600	17.9200	0.2200	3.9424	110.0000	1971.1999	(29a)
Stairwell Wall	10.6200		10.6200	0.1600	1.6992	110.0000	1168.2000	(29a)
Cycle Store Wall	16.0000		16.0000	0.2100	3.3600	110.0000	1760.0000	(29a)
Total net area of external elements Aum(A, m2)			161.8800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8799			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	21776.1199 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		395.2109 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	33.8900	0.1120	3.7957
E7 Party floor between dwellings (in blocks of flats)	33.8900	0.0380	1.2878
E16 Corner (normal)	22.0500	0.0540	1.1907
E17 Corner (inverted - internal area greater than external area)	9.4500	-0.0970	-0.9166
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0890 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	50.9688 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	74.1522	(39)
Average = Sum(39)m / 12 =												74.1522	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	1.3458	(40)
HLP (average)												1.3458	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8403	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)
Hot water usage for baths	23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)
Hot water usage for other uses	33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)
Average daily hot water use (litres/day)												103.2837	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)

Water storage loss (or HIU loss):	
Store volume	200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)
Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
204.9004 180.9252 191.4663 166.5308 160.2087 143.0303 140.1747 146.4721 148.8924 167.6264 180.2019 202.4218 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
Output from w/h
204.9004 180.9252 191.4663 166.5308 160.2087 143.0303 140.1747 146.4721 148.8924 167.6264 180.2019 202.4218 (64)
Total per year (kWh/year) = Sum(64)m = 2032.8510 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
59.1680 52.0635 54.7012 46.6992 44.3080 38.8853 37.6468 39.7406 40.8345 46.7744 51.2449 58.3439 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
18.8177 16.7137 13.5925 10.2904 7.6922 6.4941 7.0171 9.1210 12.2422 15.5443 18.1425 19.3407 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
239.4676 241.9525 235.6906 222.3597 205.5318 189.7160 179.1501 176.6651 182.9271 196.2580 213.0858 228.9017 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
47.8820 47.8820 47.8820 47.8820 47.8820 47.8820 47.8820 47.8820 47.8820 47.8820 47.8820 47.8820 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-73.6116 -73.6116 -73.6116 -73.6116 -73.6116 -73.6116 -73.6116 -73.6116 -73.6116 -73.6116 -73.6116 -73.6116 (71)
Water heating gains (Table 5)
79.5269 77.4755 73.5231 64.8600 59.5538 54.0074 50.6005 53.4148 56.7145 62.8689 71.1734 78.4192 (72)
Total internal gains
422.5000 420.8295 407.4940 382.1979 357.4656 334.9053 321.4554 323.8888 336.5716 359.3590 387.0896 411.3494 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.7100	43.0593	0.3300	0.0000	0.7700	73.4165	(77)
Northeast	2.8100	13.7804	0.3300	0.0000	0.7700	9.8395	(75)
South	5.6200	54.2217	0.3300	0.0000	0.7700	77.4309	(78)

Solar gains	160.6869	237.3352	319.7684	401.4112	439.5519	462.8310	441.2707	413.0335	368.4388	280.5382	189.1602	138.6343	(83)
Total gains	583.1869	658.1647	727.2625	783.6091	797.0175	797.7363	762.7261	736.9223	705.0104	639.8972	576.2498	549.9837	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	81.5745	
alpha	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	6.4383	
util living area	0.9945	0.9872	0.9627	0.8859	0.7194	0.4810	0.3207	0.3419	0.6186	0.9034	0.9850	0.9961	(86)
MIT	20.2204	20.3690	20.5987	20.8322	20.9645	20.9976	20.9999	20.9998	20.9886	20.8355	20.4841	20.1785	(87)
Th 2	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	19.8052	(88)
util rest of house	0.9916	0.9806	0.9441	0.8360	0.6286	0.3719	0.2047	0.2219	0.5023	0.8484	0.9758	0.9939	(89)
MIT 2	18.9499	19.1362	19.4156	19.6725	19.7868	19.8046	19.8051	19.8051	19.8015	19.6833	19.2823	18.8970	(90)
Living area fraction									fLA = Living area / (4) =			0.4436	(91)
MIT	19.5134	19.6831	19.9404	20.1869	20.3092	20.3338	20.3351	20.3350	20.3280	20.1944	19.8154	19.4654	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5134	19.6831	19.9404	20.1869	20.3092	20.3338	20.3351	20.3350	20.3280	20.1944	19.8154	19.4654	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9797	0.9467	0.8536	0.6685	0.4205	0.2562	0.2752	0.5544	0.8688	0.9759	0.9931	(94)
Useful gains	577.7643	644.8269	688.4653	668.9133	532.8050	335.4411	195.3733	202.7722	390.8554	555.9298	562.3451	546.1842	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1068.7879	1036.8736	929.8988	762.7969	549.4050	336.1884	195.3959	202.8085	395.0858	644.7077	876.1356	1065.2273	(97)
Space heating kWh	365.3215	263.4554	179.6265	67.5961	12.3504	0.0000	0.0000	0.0000	0.0000	66.0508	225.9292	386.1681	(98a)
Space heating requirement - total per year (kWh/year)												1566.4980	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	365.3215	263.4554	179.6265	67.5961	12.3504	0.0000	0.0000	0.0000	0.0000	66.0508	225.9292	386.1681	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1566.4980	
Space heating per m2											(98c) / (4) =	28.4301	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	365.3215	263.4554	179.6265	67.5961	12.3504	0.0000	0.0000	0.0000	0.0000	66.0508	225.9292	386.1681	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	365.3215	263.4554	179.6265	67.5961	12.3504	0.0000	0.0000	0.0000	0.0000	66.0508	225.9292	386.1681	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.6688	3.3137	3.6688	3.5504	3.6688	3.5504	3.6688	3.6688	3.5504	3.6688	3.5504	3.6688	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1566.4980	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2520)													
mechanical ventilation fans (SFP = 0.2520)												43.1969	(230a)
Total electricity for the above, kWh/year												43.1969	(231)
Electricity for lighting (calculated in Appendix L)												132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2369.0429	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1566.4980	27.6700	433.4500	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	27.6700	173.3298	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	43.1969	27.6700	11.9526	(249)
Energy for lighting	132.9302	27.6700	36.7818	(250)
Additional standing charges			0.0000	(251)
Total energy cost			655.5142	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1566.4980	0.1574	246.5232	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			334.9301	(265)
Pumps, fans and electric keep-hot	43.1969	0.1387	5.9919	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			360.1079	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1566.4980	1.5826	2479.1227	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			3432.4440	(279)
Pumps, fans and electric keep-hot	43.1969	1.5128	65.3482	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			3701.6850	(286)

Summary for Input Data

Plot Reference	P-33	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-33
Plot Address	Flat 2, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.66	**TER**	13.29
Environmental	94 A	**% DER < TER**			49.89
CO_2 Emissions (t/year)	0.48	**DFEE**	38.82	**TFEE**	40.45
Compliance Check	See BREL	**% DFEE < TFEE**			4.04
% DPER < TPER	2.79	**DPER**	68.33	**TPER**	70.29

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	34.01 m	86.01 m²	2.55 m

8.0 Living Area	28.23	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	65.37	41.53	0.00	None	23.84	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	22.41	20.35	0.70	Stairwell Access Corridor 3	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	19.38	19.38	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	28.22	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	229.05

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	86.01

11.0 Heat Loss Floors

Summary for Input Data

elmhurst energy

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	86.01

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Patio Door	Brickwork	South East	2.53	
SE	Window	Brickwork	South East	5.59	
East	Window	Brickwork	East	15.72	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	34.01	0.11	0.11	RCD	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	34.01	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	12.60	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	6.30	-0.10	-0.10	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	10.64	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	38.74	0.02	0.02	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	6.30	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	8.96	0.11	0.11		No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	8.96	0.00	0.02		No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	

Summary for Input Data

Test Method	Blower Door	
As Built AP_{50}	2.33	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting	No				
	Name	**Efficacy**	**Power**	**Capacity**	**Count**
	Pendant	85.00	10.00	850.00	10
	Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	

25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	

26.0 Heat Networks	None	

27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	**Shower Type**	**Flow Rate [l/min]**	**Rated Power [kW]**	**Connected**	**Connected To**
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro	None	

Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-33	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-33
Plot Address	Flat 2, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.66	**TER**	13.29
Environmental	94 A	**% DER < TER**			49.89
CO_2 Emissions (t/year)	0.48	**DFEE**	38.82	**TFEE**	40.45
Compliance Check	See BREL	**% DFEE < TFEE**			4.04
% DPER < TPER	2.79	**DPER**	68.33	**TPER**	70.29

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	86.0100	(1b)	x 2.5500	(2b) =	219.3255	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0100					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.3255	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.3300	(17)
Infiltration rate		0.1165	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0990	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1263	0.1238	0.1213	0.1089	0.1065	0.0941	0.0941	0.0916	0.0990	0.1065	0.1114	0.1164	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.5300	1.1450	2.8969			(27)
Window			21.3100	1.1450	24.4008			(27)
Ground Floor			86.0100	0.1200	10.3212	110.0000	9461.1000	(28a)
Brickwork	65.3700	23.8400	41.5300	0.2100	8.7213	110.0000	4568.3003	(29a)
Communal Wall	22.4100	2.0600	20.3500	0.2100	4.2735	110.0000	2238.5000	(29a)
Stairwell Wall	19.3800		19.3800	0.1600	3.1008	110.0000	2131.7999	(29a)
Total net area of external elements Aum(A, m2)			193.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1865			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			86.0100			30.0000	2580.3000	(32b)
Internal Wall 1			229.0500			9.0000	2061.4500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26145.6501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		303.9838 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.0100	0.1120	3.8091
E7 Party floor between dwellings (in blocks of flats)	34.0100	0.0380	1.2924
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320
E4 Jamb	38.7400	0.0160	0.6198
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P1 Party wall - Ground floor	8.9600	0.1080	0.9677
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5297 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 63.7162 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	(38)
Heat transfer coeff	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	(39)
Average = Sum(39)m / 12 =												99.9049	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	(40)
HLP (average)												1.1616	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5671 (42)

Hot water usage for mixer showers	67.2612	66.2504	64.7774	61.9592	59.8794	57.5601	56.2418	57.7036	59.3060	61.7963	64.6750	67.0035	(42a)
Hot water usage for baths	29.0477	28.6163	28.0088	26.8887	26.0500	25.1199	24.6176	25.2208	25.8777	26.8728	28.0160	28.9495	(42b)
Hot water usage for other uses	40.9194	39.4314	37.9435	36.4555	34.9675	33.4795	33.4795	34.9675	36.4555	37.9435	39.4314	40.9194	(42c)
Average daily hot water use (litres/day)												126.1438	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.2283	134.2981	130.7297	125.3034	120.8969	116.1596	114.3389	117.8920	121.6392	126.6126	132.1225	136.8724	(44)
Energy conte	217.3361	191.2388	200.9267	171.5341	162.7505	142.8318	138.2830	145.9749	149.9932	171.8120	188.2327	214.3091	(45)
Energy content (annual)										Total = Sum(45)m =		2095.2229	
Distribution loss (46)m = 0.15 x (45)m	32.6004	28.6858	30.1390	25.7301	24.4126	21.4248	20.7425	21.8962	22.4990	25.7718	28.2349	32.1464	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
									Total per year (kWh/year) = Sum(64)m =			2412.5539	(64)
12Total per year (kWh/year)												2413	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month	72.2643	63.5869	66.8081	57.0351	54.1145	47.4916	45.9791	48.5366	49.8728	57.1275	62.5874	71.2578	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7868	129.2996	116.7868	120.6796	116.7868	120.6796	116.7868	116.7868	120.6796	116.7868	120.6796	116.7868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5428	233.9455	227.8908	215.0010	198.7301	183.4376	173.2214	170.8187	176.8734	189.7631	206.0341	221.3265	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	(71)
Water heating gains (Table 5)	97.1294	94.6233	89.7959	79.2154	72.7346	65.9605	61.7999	65.2374	69.2677	76.7843	86.9269	95.7766	(72)
Total internal gains	506.9651	519.3746	495.9796	476.4022	449.7576	431.5839	413.3141	414.3490	428.3269	444.8403	475.1468	495.3960	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.5300	36.7938	0.3300	0.0000	0.7700	23.6538	(77)
East	15.7200	19.6403	0.3300	0.0000	0.7700	78.4521	(76)
Southeast	5.5900	36.7938	0.3300	0.0000	0.7700	52.2627	(77)

Solar gains	154.3685	282.7827	429.6742	587.8366	697.2973	706.2179	675.2896	593.5661	485.5295	325.0231	188.7509	129.4838	(83)
Total gains	661.3336	802.1573	925.6537	1064.2388	1147.0548	1137.8018	1088.6038	1007.9151	913.8564	769.8633	663.8977	624.8798	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	
alpha	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	
util living area	0.9973	0.9913	0.9724	0.9024	0.7512	0.5533	0.4026	0.4534	0.7126	0.9485	0.9930	0.9981	(86)
MIT	19.9279	20.1358	20.4171	20.7360	20.9283	20.9896	20.9986	20.9973	20.9595	20.6718	20.2248	19.8791	(87)
Th 2	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	(88)
util rest of house	0.9962	0.9880	0.9618	0.8691	0.6859	0.4668	0.3073	0.3515	0.6219	0.9227	0.9897	0.9973	(89)
MIT 2	18.7171	18.9812	19.3325	19.7067	19.8997	19.9462	19.9506	19.9502	19.9288	19.6456	19.0961	18.6549	(90)
Living area fraction									fLA = Living area / (4) =			0.3282	(91)
MIT	19.1145	19.3601	19.6885	20.0445	20.2373	20.2886	20.2945	20.2939	20.2671	19.9824	19.4666	19.0567	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1145	19.3601	19.6885	20.0445	20.2373	20.2886	20.2945	20.2939	20.2671	19.9824	19.4666	19.0567	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9950	0.9855	0.9585	0.8725	0.7047	0.4951	0.3387	0.3851	0.6507	0.9236	0.9876	0.9963	(94)
Useful gains	658.0250	790.5049	887.2826	928.5436	808.3737	563.3659	368.6659	388.1008	594.6486	711.0646	655.6451	622.5727	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1480.0430	1444.6378	1317.5936	1113.3928	852.9222	568.3232	369.1038	389.0162	616.1216	937.3525	1235.4828	1484.2571	(97)
Space heating kWh	611.5814	439.5773	320.1514	133.0914	33.1441	0.0000	0.0000	0.0000	0.0000	168.3582	417.4831	641.0932	(98a)
Space heating requirement - total per year (kWh/year)												2764.4800	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	611.5814	439.5773	320.1514	133.0914	33.1441	0.0000	0.0000	0.0000	0.0000	168.3582	417.4831	641.0932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2764.4800	
Space heating per m2											(98c) / (4) =	32.1414	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	611.5814	439.5773	320.1514	133.0914	33.1441	0.0000	0.0000	0.0000	0.0000	168.3582	417.4831	641.0932	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	611.5814	439.5773	320.1514	133.0914	33.1441	0.0000	0.0000	0.0000	0.0000	168.3582	417.4831	641.0932	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.2766	66.4310	70.2200	60.8949	58.4562	52.0503	50.9166	53.2868	54.2571	61.2484	66.0405	74.3438	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.7270	4.2695	4.7270	4.5745	4.7270	4.5745	4.7270	4.7270	4.5745	4.7270	4.5745	4.7270	(231)
Lighting	23.7700	19.0692	17.1697	12.5792	9.7166	7.9385	8.8638	11.5215	14.9653	19.6352	22.1779	24.4306	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2764.4800	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												743.4223	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	55.6560	(230a)
Total electricity for the above, kWh/year	55.6560	(231)
Electricity for lighting (calculated in Appendix L)	191.8375	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3755.3958	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2764.4800	0.1566	432.8452	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	743.4223	0.1412	104.9721	(264)
Space and water heating			537.8173	(265)
Pumps, fans and electric keep-hot	55.6560	0.1387	7.7202	(267)
Energy for lighting	191.8375	0.1443	27.6881	(268)
Total CO2, kg/year			573.2256	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.6600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2764.4800	1.5796	4366.8754	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	743.4223	1.5221	1131.5821	(278)
Space and water heating			5498.4575	(279)
Pumps, fans and electric keep-hot	55.6560	1.5128	84.1965	(281)
Energy for lighting	191.8375	1.5338	294.2467	(282)
Total Primary energy kWh/year			5876.9007	(286)
Dwelling Primary energy Rate (DPER)			68.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	86.0100	(1b)	x 2.5500	(2b) =	219.3255	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.3255	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1368	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3868	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3288	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4192	0.4110	0.4027	0.3616	0.3534	0.3123	0.3123	0.3041	0.3288	0.3534	0.3699	0.3863	(22b)
Effective ac	0.5879	0.5844	0.5811	0.5654	0.5625	0.5488	0.5488	0.5462	0.5540	0.5625	0.5684	0.5746	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			19.4400	1.1450	22.2595			(27)
Ground Floor			86.0100	0.1300	11.1813			(28a)
Brickwork	65.3700	19.4400	45.9300	0.1800	8.2674			(29a)
Communal Wall	22.4100	2.0600	20.3500	0.1800	3.6630			(29a)
Stairwell Wall	19.3800		19.3800	0.1800	3.4884			(29a)
Total net area of external elements Aum(A, m2)			193.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.9196			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 303.9838 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E5 Ground floor (normal)	34.0100	0.1600	5.4416	
E7 Party floor between dwellings (in blocks of flats)	34.0100	0.0700	2.3807	
E16 Corner (normal)	12.6000	0.0900	1.1340	
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670	
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320	
E4 Jamb	38.7400	0.0500	1.9370	
E18 Party wall between dwellings	6.3000	0.0600	0.3780	
P1 Party wall - Ground floor	8.9600	0.0800	0.7168	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.9531 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 62.8727 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.5474	42.3005	42.0584	40.9216	40.7090	39.7189	39.7189	39.5355	40.1002	40.7090	41.1392	41.5891	(38)
Heat transfer coeff	105.4201	105.1732	104.9312	103.7944	103.5817	102.5916	102.5916	102.4082	102.9730	103.5817	104.0120	104.4618	(39)

Average = Sum(39)m / 12 = 103.7934

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2257	1.2228	1.2200	1.2068	1.2043	1.1928	1.1928	1.1907	1.1972	1.2043	1.2093	1.2145	(40)
HLP (average)												1.2068	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5671 (42)

Hot water usage for mixer showers

67.2612	66.2504	64.7774	61.9592	59.8794	57.5601	56.2418	57.7036	59.3060	61.7963	64.6750	67.0035	(42a)

Hot water usage for baths

29.0477	28.6163	28.0088	26.8887	26.0500	25.1199	24.6176	25.2208	25.8777	26.8728	28.0160	28.9495	(42b)

Hot water usage for other uses

40.9194	39.4314	37.9435	36.4555	34.9675	33.4795	33.4795	34.9675	36.4555	37.9435	39.4314	40.9194	(42c)

Average daily hot water use (litres/day) 126.1438 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.2283	134.2981	130.7297	125.3034	120.8969	116.1596	114.3389	117.8920	121.6392	126.6126	132.1225	136.8724	(44)
Energy conte	217.3361	191.2388	200.9267	171.5341	162.7505	142.8318	138.2830	145.9749	149.9932	171.8120	188.2327	214.3091	(45)
Energy content (annual)										Total = Sum(45)m =		2095.2229	
Distribution loss (46)m = 0.15 x (45)m	32.6004	28.6858	30.1390	25.7301	24.4126	21.4248	20.7425	21.8962	22.4990	25.7718	28.2349	32.1464	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	263.9310	233.3245	247.5216	216.6259	209.3454	187.9236	184.8779	192.5698	195.0851	218.4069	233.3245	260.9040	(62)
WWHRS	-30.7490	-27.1947	-28.4767	-23.5798	-21.9755	-18.8046	-17.6263	-18.7438	-19.4560	-22.9365	-25.9842	-30.1796	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.1820	206.1298	219.0449	193.0461	187.3699	169.1190	167.2516	173.8259	175.6291	195.4705	207.3403	230.7245	(64)
										Total per year (kWh/year) = Sum(64)m =		2358.1335	(64)
12Total per year (kWh/year)												2358	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.5402	97.2555	104.0841	93.1086	91.3905	83.5650	83.2550	85.8126	85.9462	94.4034	98.6608	108.5337	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7655	129.2761	116.7655	120.6577	116.7655	120.6577	116.7655	116.7655	120.6577	116.7655	120.6577	116.7655	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5428	233.9455	227.8908	215.0010	198.7301	183.4376	173.2214	170.8187	176.8734	189.7631	206.0341	221.3265	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830		(71)
Water heating gains (Table 5)													
	147.2314	144.7254	139.8979	129.3174	122.8366	116.0626	111.9019	115.3395	119.3698	126.8863	137.0289	145.8786	(72)
Total internal gains													
	560.0459	572.4531	549.0604	529.4824	502.8384	481.6640	463.3949	464.4298	478.4070	497.9211	528.2269	548.4768	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.8200	19.6403	0.6300	0.7000	0.7700	76.9497	(76)
Southeast	6.6200	36.7938	0.6300	0.7000	0.7700	74.4397	(77)

Solar gains	151.3895	277.3284	421.3926	576.5135	683.8700	692.6204	662.2871	582.1345	476.1739	318.7558	185.1089	126.9846	(83)
Total gains	711.4354	849.7816	970.4530	1105.9958	1186.7084	1174.2844	1125.6820	1046.5643	954.5809	816.6769	713.3358	675.4615	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.8927	69.0545	69.2138	69.9718	70.1155	70.7922	70.7922	70.9189	70.5300	70.1155	69.8254	69.5248	
alpha	5.5928	5.6036	5.6143	5.6648	5.6744	5.7195	5.7195	5.7279	5.7020	5.6744	5.6550	5.6350	
util living area													
	0.9962	0.9894	0.9694	0.8983	0.7495	0.5501	0.3997	0.4475	0.7033	0.9403	0.9906	0.9972	(86)
MIT	19.8933	20.1026	20.3884	20.7231	20.9220	20.9888	20.9985	20.9972	20.9586	20.6735	20.2203	19.8602	(87)
Th 2	19.8995	19.9018	19.9040	19.9146	19.9166	19.9258	19.9258	19.9275	19.9222	19.9166	19.9126	19.9084	(88)
util rest of house													
	0.9947	0.9854	0.9578	0.8637	0.6827	0.4621	0.3029	0.3447	0.6108	0.9112	0.9862	0.9960	(89)
MIT 2	18.6347	18.9016	19.2594	19.6600	19.8611	19.9208	19.9254	19.9268	19.8999	19.6174	19.0610	18.5990	(90)
Living area fraction										fLA = Living area / (4) =		0.3282	(91)
MIT	19.0478	19.2958	19.6300	20.0089	20.2093	20.2713	20.2776	20.2781	20.2474	19.9640	19.4415	19.0129	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0478	19.2958	19.6300	20.0089	20.2093	20.2713	20.2776	20.2781	20.2474	19.9640	19.4415	19.0129	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9824	0.9542	0.8671	0.7018	0.4909	0.3347	0.3786	0.6402	0.9128	0.9836	0.9947	(94)
Useful gains	706.5363	834.7979	925.9611	958.9809	832.7896	576.4910	376.8088	396.1881	611.1265	745.4474	701.6720	671.8831	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1554.7123	1514.0530	1377.7434	1153.0424	881.4071	581.8274	377.2923	397.1474	633.0167	969.9428	1283.6608	1547.3844	(97)
Space heating kWh													
	631.0430	456.4594	336.1261	139.7243	36.1714	0.0000	0.0000	0.0000	0.0000	167.0246	419.0319	651.3729	(98a)
Space heating requirement - total per year (kWh/year)												2836.9537	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	631.0430	456.4594	336.1261	139.7243	36.1714	0.0000	0.0000	0.0000	0.0000	167.0246	419.0319	651.3729	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2836.9537	
Space heating per m2											(98c) / (4) =	32.9840	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	631.0430	456.4594	336.1261	139.7243	36.1714	0.0000	0.0000	0.0000	0.0000	167.0246	419.0319	651.3729	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	683.6869	494.5389	364.1669	151.3806	39.1890	0.0000	0.0000	0.0000	0.0000	180.9584	453.9891	705.7128	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	233.1820	206.1298	219.0449	193.0461	187.3699	169.1190	167.2516	173.8259	175.6291	195.4705	207.3403	230.7245	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1776	85.7900	85.0169	83.3469	81.1305	79.8000	79.8000	79.8000	79.8000	83.7091	85.6042	86.2555	(217)
Fuel for water heating, kWh/month													
	270.5832	240.2727	257.6488	231.6177	230.9487	211.9285	209.5885	217.8270	220.0866	233.5115	242.2082	267.4896	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.2616	19.4635	17.5248	12.8394	9.9175	8.1027	9.0471	11.7597	15.2747	20.0413	22.6366	24.9359	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-22.8375	-33.7244	-50.7463	-59.8118	-66.8987	-63.3081	-62.5200	-57.8209	-49.9650	-39.7536	-25.6390	-19.5691	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6464	-18.5491	-37.5514	-57.4205	-76.9389	-77.6909	-76.7923	-64.5666	-46.7228	-26.8757	-11.6539	-6.8119	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3073.6227	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2833.7108	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	195.8048	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1062.8150	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5126.3233	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3073.6227	0.2100	645.4608	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2833.7108	0.2100	595.0793	(264)
Space and water heating			1240.5400	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	195.8048	0.1443	28.2607	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-552.5945	0.1336	-73.8424	
PV Unit electricity exported	-510.2204	0.1254	-63.9656	
Total			-137.8080	(269)
Total CO2, kg/year			1142.9219	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.2900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3073.6227	1.1300	3473.1936	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2833.7108	1.1300	3202.0932	(278)
Space and water heating			6675.2868	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	195.8048	1.5338	300.3319	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-552.5945	1.4938	-825.4737	
PV Unit electricity exported	-510.2204	0.4602	-234.7847	
Total			-1060.2583	(283)
Total Primary energy kWh/year			6045.4612	(286)
Target Primary Energy Rate (TPER)			70.2900	(287)

Full SAP Calculation Printout

Plot Reference	P-33	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-33
Plot Address	Flat 2, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.66	**TER**	13.29
Environmental	94 A	**% DER < TER**			49.89
CO_2 Emissions (t/year)	0.48	**DFEE**	38.82	**TFEE**	40.45
Compliance Check	See BREL	**% DFEE < TFEE**			4.04
% DPER < TPER	2.79	**DPER**	68.33	**TPER**	70.29

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	86.0100	(1b)	x 2.5500	(2b) =	219.3255	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0100					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.3255	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1368	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.3300	(17)
Infiltration rate		0.2533	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2153	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2745	0.2691	0.2637	0.2368	0.2314	0.2045	0.2045	0.1991	0.2153	0.2314	0.2422	0.2530	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5377	0.5362	0.5348	0.5280	0.5268	0.5209	0.5209	0.5198	0.5232	0.5268	0.5293	0.5320	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.5300	1.1450	2.8969			(27)
Window			21.3100	1.1450	24.4008			(27)
Ground Floor			86.0100	0.1200	10.3212	110.0000	9461.1000	(28a)
Brickwork	65.3700	23.8400	41.5300	0.2100	8.7213	110.0000	4568.3003	(29a)
Communal Wall	22.4100	2.0600	20.3500	0.2100	4.2735	110.0000	2238.5000	(29a)
Stairwell Wall	19.3800		19.3800	0.1600	3.1008	110.0000	2131.7999	(29a)
Total net area of external elements Aum(A, m2)			193.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.1865			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			86.0100			30.0000	2580.3000	(32b)
Internal Wall 1			229.0500			9.0000	2061.4500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26145.6501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		303.9838 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	34.0100	0.1120	3.8091	
E7 Party floor between dwellings (in blocks of flats)	34.0100	0.0380	1.2924	
E16 Corner (normal)	12.6000	0.0540	0.6804	
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111	
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320	
E4 Jamb	38.7400	0.0160	0.6198	
E18 Party wall between dwellings	6.3000	0.0380	0.2394	
P1 Party wall - Ground floor	8.9600	0.1080	0.9677	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5297 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 63.7162 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.9154	38.8096	38.7058	38.2183	38.1271	37.7025	37.7025	37.6239	37.8661	38.1271	38.3116	38.5045	(38)
Heat transfer coeff	102.6317	102.5258	102.4220	101.9345	101.8433	101.4187	101.4187	101.3401	101.5823	101.8433	102.0278	102.2207	(39)

Average = Sum(39)m / 12 = 101.9341

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1933	1.1920	1.1908	1.1851	1.1841	1.1792	1.1792	1.1782	1.1811	1.1841	1.1862	1.1885	(40)
HLP (average)												1.1851	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5671 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.0477	28.6163	28.0088	26.8887	26.0500	25.1199	24.6176	25.2208	25.8777	26.8728	28.0160	28.9495	(42b)

Hot water usage for other uses

40.9194	39.4314	37.9435	36.4555	34.9675	33.4795	33.4795	34.9675	36.4555	37.9435	39.4314	40.9194	(42c)

Average daily hot water use (litres/day) 64.1313 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
69.9672	68.0478	65.9523	63.3442	61.0175	58.5995	58.0971	60.1884	62.3332	64.8163	67.4475	69.8690	(44)
Energy conte 110.8109	96.8991	101.3662	86.7150	82.1413	72.0549	70.2634	74.5258	76.8630	87.9551	96.0913	109.3979	(45)

Energy content (annual) Total = Sum(45)m = 1065.0839

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.1892	82.3643	86.1613	73.7078	69.8201	61.2467	59.7239	63.3469	65.3336	74.7618	81.6776	92.9882	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.1892	82.3643	86.1613	73.7078	69.8201	61.2467	59.7239	63.3469	65.3336	74.7618	81.6776	92.9882	(64)

Total per year (kWh/year) = Sum(64)m = 905.3213 (64)

12Total per year (kWh/year) 905 (64)

Electric shower(s)

53.8650	47.9941	52.4078	50.0121	50.9506	48.6019	50.2219	50.9506	50.0121	52.4078	51.4223	53.8650	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 612.7110 (64a)

Heat gains from water heating, kWh/month

37.0136	32.5896	34.6423	30.9300	30.1927	27.4621	27.4865	28.5744	28.8364	31.7924	33.2750	36.7133	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7868	129.2996	116.7868	120.6796	116.7868	120.6796	116.7868	116.7868	120.6796	116.7868	120.6796	116.7868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5428	233.9455	227.8908	215.0010	198.7301	183.4376	173.2214	170.8187	176.8734	189.7631	206.0341	221.3265	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	(71)
Water heating gains (Table 5)	49.7494	48.4964	46.5622	42.9583	40.5815	38.1419	36.9442	38.4064	40.0506	42.7317	46.2152	49.3458	(72)
Total internal gains	459.5851	473.2477	452.7459	440.1451	417.6045	403.7653	388.4584	387.5180	399.1097	410.7877	434.4351	448.9652	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.5300	36.7938	0.3300	0.0000	0.7700	23.6538	(77)
East	15.7200	19.6403	0.3300	0.0000	0.7700	78.4521	(76)
Southeast	5.5900	36.7938	0.3300	0.0000	0.7700	52.2627	(77)

Solar gains	154.3685	282.7827	429.6742	587.8366	697.2973	706.2179	675.2896	593.5661	485.5295	325.0231	188.7509	129.4838	(83)
Total gains	613.9536	756.0304	882.4201	1027.9817	1114.9017	1109.9832	1063.7481	981.0841	884.6392	735.8108	623.1860	578.4491	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.7645	70.8376	70.9094	71.2485	71.3123	71.6108	71.6108	71.6664	71.4955	71.3123	71.1833	71.0490	
alpha	5.7176	5.7225	5.7273	5.7499	5.7542	5.7741	5.7741	5.7778	5.7664	5.7542	5.7456	5.7366	
util living area	0.9982	0.9938	0.9788	0.9174	0.7746	0.5735	0.4179	0.4717	0.7381	0.9590	0.9950	0.9987	(86)
MIT	19.8356	20.0488	20.3426	20.6926	20.9115	20.9868	20.9982	20.9965	20.9492	20.6256	20.1551	19.7940	(87)
Th 2	19.9254	19.9264	19.9274	19.9319	19.9328	19.9367	19.9367	19.9375	19.9352	19.9328	19.9310	19.9292	(88)
util rest of house	0.9974	0.9913	0.9703	0.8872	0.7097	0.4836	0.3178	0.3647	0.6465	0.9371	0.9926	0.9982	(89)
MIT 2	18.8771	19.0896	19.3782	19.7069	19.8827	19.9320	19.9364	19.9367	19.9131	19.6564	19.2000	18.8387	(90)
Living area fraction										fLA = Living area / (4) =		0.3282	(91)
MIT	19.1917	19.4044	19.6948	20.0305	20.2204	20.2782	20.2849	20.2846	20.2532	19.9745	19.5135	19.1523	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1917	19.4044	19.6948	20.0305	20.2204	20.2782	20.2849	20.2846	20.2532	19.9745	19.5135	19.1523	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9896	0.9680	0.8904	0.7283	0.5131	0.3508	0.4000	0.6756	0.9381	0.9913	0.9976	(94)
Useful gains	611.9524	748.2044	854.1552	915.3452	812.0100	569.5350	373.1385	392.4534	597.6954	690.2740	617.7599	577.0825	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1528.3627	1487.0752	1351.4342	1134.5784	867.7467	575.8771	373.7164	393.6610	625.0545	954.7292	1266.5192	1528.4317	(97)
Space heating kWh	681.8093	496.5212	369.9756	157.8478	41.4681	0.0000	0.0000	0.0000	0.0000	196.7547	467.1067	707.8038	(98a)
Space heating requirement - total per year (kWh/year)												3119.2871	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	681.8093	496.5212	369.9756	157.8478	41.4681	0.0000	0.0000	0.0000	0.0000	196.7547	467.1067	707.8038	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3119.2871	
Space heating per m2										(98c) / (4) =		36.2666	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	953.3362	750.4987	770.1849	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9413	0.9740	0.9589	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	897.3413	730.9908	738.5395	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1251.9083	1200.1355	1105.8012	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	255.2882	349.0436	273.2428	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	63.8221	87.2609	68.3107	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												219.3937	(107)
Energy for space heating												36.2666	(99)
Energy for space cooling												2.5508	(108)
Total												38.8174	(109)
Fabric Energy Efficiency (DFEE)												38.8	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	86.0100	(1b)	x 2.5500	(2b) =	219.3255	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.3255	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) =	0.1368	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3868	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3288	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4192	0.4110	0.4027	0.3616	0.3534	0.3123	0.3123	0.3041	0.3288	0.3534	0.3699	0.3863	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5879	0.5844	0.5811	0.5654	0.5625	0.5488	0.5488	0.5462	0.5540	0.5625	0.5684	0.5746	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			19.4400	1.1450	22.2595			(27)
Ground Floor			86.0100	0.1300	11.1813			(28a)
Brickwork	65.3700	19.4400	45.9300	0.1800	8.2674			(29a)
Communal Wall	22.4100	2.0600	20.3500	0.1800	3.6630			(29a)
Stairwell Wall	19.3800		19.3800	0.1800	3.4884			(29a)
Total net area of external elements Aum(A, m2)			193.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.9196			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	303.9838	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.0100	0.1600	5.4416
E7 Party floor between dwellings (in blocks of flats)	34.0100	0.0700	2.3807
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320
E4 Jamb	38.7400	0.0500	1.9370
E18 Party wall between dwellings	6.3000	0.0600	0.3780
P1 Party wall - Ground floor	8.9600	0.0800	0.7168
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	11.9531	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	62.8727	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.5474	42.3005	42.0584	40.9216	40.7090	39.7189	39.7189	39.5355	40.1002	40.7090	41.1392	41.5891	(38)
Heat transfer coeff	105.4201	105.1732	104.9312	103.7944	103.5817	102.5916	102.5916	102.4082	102.9730	103.5817	104.0120	104.4618	(39)
Average = Sum(39)m / 12 =												103.7934	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2257	1.2228	1.2200	1.2068	1.2043	1.1928	1.1928	1.1907	1.1972	1.2043	1.2093	1.2145	(40)
HLP (average)												1.2068	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5671	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.0477	28.6163	28.0088	26.8887	26.0500	25.1199	24.6176	25.2208	25.8777	26.8728	28.0160	28.9495	(42b)

Hot water usage for other uses

40.9194	39.4314	37.9435	36.4555	34.9675	33.4795	33.4795	34.9675	36.4555	37.9435	39.4314	40.9194	(42c)

Average daily hot water use (litres/day)	64.1313	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	69.9672	68.0478	65.9523	63.3442	61.0175	58.5995	58.0971	60.1884	62.3332	64.8163	67.4475	69.8690	(44)
Energy conte	110.8109	96.8991	101.3662	86.7150	82.1413	72.0549	70.2634	74.5258	76.8630	87.9551	96.0913	109.3979	(45)
Energy content (annual)										Total = Sum(45)m =		1065.0839	

Distribution loss (46)m = 0.15 x (45)m

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.1892	82.3643	86.1613	73.7078	69.8201	61.2467	59.7239	63.3469	65.3336	74.7618	81.6776	92.9882	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.1892	82.3643	86.1613	73.7078	69.8201	61.2467	59.7239	63.3469	65.3336	74.7618	81.6776	92.9882	(64)

Total per year (kWh/year) = Sum(64)m =	905.3213	(64)
12Total per year (kWh/year)	905	(64)

Electric shower(s)

53.8650	47.9941	52.4078	50.0121	50.9506	48.6019	50.2219	50.9506	50.0121	52.4078	51.4223	53.8650	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	612.7110	(64a)

Heat gains from water heating, kWh/month

37.0136	32.5896	34.6423	30.9300	30.1927	27.4621	27.4865	28.5744	28.8364	31.7924	33.2750	36.7133	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	116.7655	129.2761	116.7655	120.6577	116.7655	120.6577	116.7655	116.7655	120.6577	116.7655	120.6577	116.7655	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	231.5428	233.9455	227.8908	215.0010	198.7301	183.4376	173.2214	170.8187	176.8734	189.7631	206.0341	221.3265	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	(71)
Water heating gains (Table 5)													
	49.7494	48.4964	46.5622	42.9583	40.5815	38.1419	36.9442	38.4064	40.0506	42.7317	46.2152	49.3458	(72)
Total internal gains													
	459.5639	473.2242	452.7246	440.1232	417.5833	403.7433	388.4372	387.4967	399.0878	410.7665	434.4132	448.9440	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.8200	19.6403	0.6300	0.7000	0.7700	76.9497	(76)
Southeast	6.6200	36.7938	0.6300	0.7000	0.7700	74.4397	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	151.3895	277.3284	421.3926	576.5135	683.8700	692.6204	662.2871	582.1345	476.1739	318.7558	185.1089	126.9846	(83)
Total gains	610.9534	750.5526	874.1173	1016.6367	1101.4533	1096.3637	1050.7243	969.6312	875.2617	729.5223	619.5221	575.9287	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.8927	69.0545	69.2138	69.9718	70.1155	70.7922	70.7922	70.9189	70.5300	70.1155	69.8254	69.5248	
alpha	5.5928	5.6036	5.6143	5.6648	5.6744	5.7195	5.7195	5.7279	5.7020	5.6744	5.6550	5.6350	
util living area													
	0.9982	0.9941	0.9806	0.9238	0.7878	0.5857	0.4277	0.4818	0.7500	0.9618	0.9952	0.9987	(86)
MIT	19.7893	20.0030	20.3003	20.6658	20.8991	20.9847	20.9978	20.9959	20.9428	20.6035	20.1253	19.7565	(87)
Th 2	19.8995	19.9018	19.9040	19.9146	19.9166	19.9258	19.9258	19.9275	19.9222	19.9166	19.9126	19.9084	(88)
util rest of house													
	0.9975	0.9918	0.9726	0.8950	0.7232	0.4937	0.3244	0.3717	0.6579	0.9410	0.9929	0.9982	(89)
MIT 2	18.8104	19.0245	19.3182	19.6684	19.8590	19.9203	19.9254	19.9266	19.8972	19.6225	19.1557	18.7848	(90)
Living area fraction									fLA = Living area / (4) =			0.3282	(91)
MIT	19.1317	19.3457	19.6405	19.9957	20.2004	20.2697	20.2774	20.2776	20.2404	19.9445	19.4739	19.1037	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1317	19.3457	19.6405	19.9957	20.2004	20.2697	20.2774	20.2776	20.2404	19.9445	19.4739	19.1037	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9968	0.9902	0.9702	0.8975	0.7414	0.5238	0.3584	0.4081	0.6870	0.9417	0.9916	0.9977	(94)
Useful gains	609.0070	743.1822	848.0777	912.4493	816.5656	574.2814	376.5766	395.6825	601.3014	686.9594	614.3386	574.5899	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1563.5591	1519.2956	1378.8508	1151.6750	880.4845	581.6598	377.2679	397.0963	632.2920	967.9175	1287.0365	1556.8698	(97)
Space heating kWh													
	710.1868	521.5481	394.8952	172.2426	47.5557	0.0000	0.0000	0.0000	0.0000	209.0328	484.3425	730.8163	(98a)
Space heating requirement - total per year (kWh/year)												3270.6199	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	710.1868	521.5481	394.8952	172.2426	47.5557	0.0000	0.0000	0.0000	0.0000	209.0328	484.3425	730.8163	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3270.6199	
Space heating per m2											(98c) / (4) =	38.0260	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	964.3610	759.1778	778.3027	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9345	0.9704	0.9541	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	901.1812	736.6709	742.5549	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1236.0133	1184.9356	1092.4369	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	241.0791	333.5089	260.3122	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	60.2698	83.3772	65.0781	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												208.7251	(107)
Energy for space heating												38.0260	(99)
Energy for space cooling												2.4268	(108)
Total												40.4528	(109)
Fabric Energy Efficiency (TFEE)												40.5	(109)

Full SAP Calculation Printout

Plot Reference	P-33	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-33
Plot Address	Flat 2, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.66	**TER**	13.29
Environmental	94 A	**% DER < TER**			49.89
CO_2 Emissions (t/year)	0.48	**DFEE**	38.82	**TFEE**	40.45
Compliance Check	See BREL	**% DFEE < TFEE**			4.04
% DPER < TPER	2.79	**DPER**	68.33	**TPER**	70.29

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	86.0100	(1b)	x 2.5500	(2b) =	219.3255	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0100					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.3255	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.3300	(17)
Infiltration rate		0.1165	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0990	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1263	0.1238	0.1213	0.1089	0.1065	0.0941	0.0941	0.0916	0.0990	0.1065	0.1114	0.1164	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.5300	1.1450	2.8969			(27)
Window			21.3100	1.1450	24.4008			(27)
Ground Floor			86.0100	0.1200	10.3212	110.0000	9461.1000	(28a)
Brickwork	65.3700	23.8400	41.5300	0.2100	8.7213	110.0000	4568.3003	(29a)
Communal Wall	22.4100	2.0600	20.3500	0.2100	4.2735	110.0000	2238.5000	(29a)
Stairwell Wall	19.3800		19.3800	0.1600	3.1008	110.0000	2131.7999	(29a)
Total net area of external elements Aum(A, m2)			193.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1865			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			86.0100			30.0000	2580.3000	(32b)
Internal Wall 1			229.0500			9.0000	2061.4500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26145.6501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		303.9838 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.0100	0.1120	3.8091
E7 Party floor between dwellings (in blocks of flats)	34.0100	0.0380	1.2924
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320
E4 Jamb	38.7400	0.0160	0.6198
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P1 Party wall - Ground floor	8.9600	0.1080	0.9677
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5297 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 63.7162 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	(38)
Heat transfer coeff	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	(39)
Average = Sum(39)m / 12 =												99.9049	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	(40)
HLP (average)												1.1616	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5671 (42)

Hot water usage for mixer showers	67.2612	66.2504	64.7774	61.9592	59.8794	57.5601	56.2418	57.7036	59.3060	61.7963	64.6750	67.0035	(42a)
Hot water usage for baths	29.0477	28.6163	28.0088	26.8887	26.0500	25.1199	24.6176	25.2208	25.8777	26.8728	28.0160	28.9495	(42b)
Hot water usage for other uses	40.9194	39.4314	37.9435	36.4555	34.9675	33.4795	33.4795	34.9675	36.4555	37.9435	39.4314	40.9194	(42c)
Average daily hot water use (litres/day)												126.1438	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.2283	134.2981	130.7297	125.3034	120.8969	116.1596	114.3389	117.8920	121.6392	126.6126	132.1225	136.8724	(44)
Energy conte	217.3361	191.2388	200.9267	171.5341	162.7505	142.8318	138.2830	145.9749	149.9932	171.8120	188.2327	214.3091	(45)
Energy content (annual)										Total = Sum(45)m =		2095.2229	
Distribution loss (46)m = 0.15 x (45)m	32.6004	28.6858	30.1390	25.7301	24.4126	21.4248	20.7425	21.8962	22.4990	25.7718	28.2349	32.1464	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
									Total per year (kWh/year) = Sum(64)m =			2412.5539	(64)
12Total per year (kWh/year)												2413	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month	72.2643	63.5869	66.8081	57.0351	54.1145	47.4916	45.9791	48.5366	49.8728	57.1275	62.5874	71.2578	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7868	129.2996	116.7868	120.6796	116.7868	120.6796	116.7868	116.7868	120.6796	116.7868	120.6796	116.7868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5428	233.9455	227.8908	215.0010	198.7301	183.4376	173.2214	170.8187	176.8734	189.7631	206.0341	221.3265	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	(71)
Water heating gains (Table 5)	97.1294	94.6233	89.7959	79.2154	72.7346	65.9605	61.7999	65.2374	69.2677	76.7843	86.9269	95.7766	(72)
Total internal gains	506.9651	519.3746	495.9796	476.4022	449.7576	431.5839	413.3141	414.3490	428.3269	444.8403	475.1468	495.3960	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.5300	36.7938	0.3300	0.0000	0.7700	23.6538	(77)
East	15.7200	19.6403	0.3300	0.0000	0.7700	78.4521	(76)
Southeast	5.5900	36.7938	0.3300	0.0000	0.7700	52.2627	(77)

Solar gains	154.3685	282.7827	429.6742	587.8366	697.2973	706.2179	675.2896	593.5661	485.5295	325.0231	188.7509	129.4838	(83)
Total gains	661.3336	802.1573	925.6537	1064.2388	1147.0548	1137.8018	1088.6038	1007.9151	913.8564	769.8633	663.8977	624.8798	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	
alpha	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	
util living area	0.9973	0.9913	0.9724	0.9024	0.7512	0.5533	0.4026	0.4534	0.7126	0.9485	0.9930	0.9981	(86)
MIT	19.9279	20.1358	20.4171	20.7360	20.9283	20.9896	20.9986	20.9973	20.9595	20.6718	20.2248	19.8791	(87)
Th 2	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	(88)
util rest of house	0.9962	0.9880	0.9618	0.8691	0.6859	0.4668	0.3073	0.3515	0.6219	0.9227	0.9897	0.9973	(89)
MIT 2	18.7171	18.9812	19.3325	19.7067	19.8997	19.9462	19.9506	19.9502	19.9288	19.6456	19.0961	18.6549	(90)
Living area fraction									fLA = Living area / (4) =			0.3282	(91)
MIT	19.1145	19.3601	19.6885	20.0445	20.2373	20.2886	20.2945	20.2939	20.2671	19.9824	19.4666	19.0567	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1145	19.3601	19.6885	20.0445	20.2373	20.2886	20.2945	20.2939	20.2671	19.9824	19.4666	19.0567	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9950	0.9855	0.9585	0.8725	0.7047	0.4951	0.3387	0.3851	0.6507	0.9236	0.9876	0.9963	(94)
Useful gains	658.0250	790.5049	887.2826	928.5436	808.3737	563.3659	368.6659	388.1008	594.6486	711.0646	655.6451	622.5727	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1480.0430	1444.6378	1317.5936	1113.3928	852.9222	568.3232	369.1038	389.0162	616.1216	937.3525	1235.4828	1484.2571	(97)
Space heating kWh	611.5814	439.5773	320.1514	133.0914	33.1441	0.0000	0.0000	0.0000	0.0000	168.3582	417.4831	641.0932	(98a)
Space heating requirement - total per year (kWh/year)												2764.4800	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	611.5814	439.5773	320.1514	133.0914	33.1441	0.0000	0.0000	0.0000	0.0000	168.3582	417.4831	641.0932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2764.4800	
Space heating per m2											(98c) / (4) =	32.1414	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	611.5814	439.5773	320.1514	133.0914	33.1441	0.0000	0.0000	0.0000	0.0000	168.3582	417.4831	641.0932	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	611.5814	439.5773	320.1514	133.0914	33.1441	0.0000	0.0000	0.0000	0.0000	168.3582	417.4831	641.0932	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.2766	66.4310	70.2200	60.8949	58.4562	52.0503	50.9166	53.2868	54.2571	61.2484	66.0405	74.3438	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.7270	4.2695	4.7270	4.5745	4.7270	4.5745	4.7270	4.7270	4.5745	4.7270	4.5745	4.7270	(231)
Lighting	23.7700	19.0692	17.1697	12.5792	9.7166	7.9385	8.8638	11.5215	14.9653	19.6352	22.1779	24.4306	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2764.4800	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												743.4223	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	55.6560	(230a)
Total electricity for the above, kWh/year	55.6560	(231)
Electricity for lighting (calculated in Appendix L)	191.8375	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3755.3958	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2764.4800	0.1566	432.8452	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	743.4223	0.1412	104.9721	(264)
Space and water heating			537.8173	(265)
Pumps, fans and electric keep-hot	55.6560	0.1387	7.7202	(267)
Energy for lighting	191.8375	0.1443	27.6881	(268)
Total CO2, kg/year			573.2256	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.6600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2764.4800	1.5796	4366.8754	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	743.4223	1.5221	1131.5821	(278)
Space and water heating			5498.4575	(279)
Pumps, fans and electric keep-hot	55.6560	1.5128	84.1965	(281)
Energy for lighting	191.8375	1.5338	294.2467	(282)
Total Primary energy kWh/year			5876.9007	(286)
Dwelling Primary energy Rate (DPER)			68.3300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	86.0100	(1b)	x 2.5500	(2b) =	219.3255	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.3255	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1368	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3868	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3288	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4192	0.4110	0.4027	0.3616	0.3534	0.3123	0.3123	0.3041	0.3288	0.3534	0.3699	0.3863	(22b)
Effective ac	0.5879	0.5844	0.5811	0.5654	0.5625	0.5488	0.5488	0.5462	0.5540	0.5625	0.5684	0.5746	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			19.4400	1.1450	22.2595			(27)
Ground Floor			86.0100	0.1300	11.1813			(28a)
Brickwork	65.3700	19.4400	45.9300	0.1800	8.2674			(29a)
Communal Wall	22.4100	2.0600	20.3500	0.1800	3.6630			(29a)
Stairwell Wall	19.3800		19.3800	0.1800	3.4884			(29a)
Total net area of external elements Aum(A, m2)			193.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.9196			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 303.9838 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E5 Ground floor (normal)	34.0100	0.1600	5.4416	
E7 Party floor between dwellings (in blocks of flats)	34.0100	0.0700	2.3807	
E16 Corner (normal)	12.6000	0.0900	1.1340	
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670	
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320	
E4 Jamb	38.7400	0.0500	1.9370	
E18 Party wall between dwellings	6.3000	0.0600	0.3780	
P1 Party wall - Ground floor	8.9600	0.0800	0.7168	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.9531 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 62.8727 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.5474	42.3005	42.0584	40.9216	40.7090	39.7189	39.7189	39.5355	40.1002	40.7090	41.1392	41.5891	(38)
Heat transfer coeff	105.4201	105.1732	104.9312	103.7944	103.5817	102.5916	102.5916	102.4082	102.9730	103.5817	104.0120	104.4618	(39)

Average = Sum(39)m / 12 = 103.7934

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2257	1.2228	1.2200	1.2068	1.2043	1.1928	1.1928	1.1907	1.1972	1.2043	1.2093	1.2145	(40)
HLP (average)												1.2068	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5671 (42)

Hot water usage for mixer showers

67.2612	66.2504	64.7774	61.9592	59.8794	57.5601	56.2418	57.7036	59.3060	61.7963	64.6750	67.0035	(42a)

Hot water usage for baths

29.0477	28.6163	28.0088	26.8887	26.0500	25.1199	24.6176	25.2208	25.8777	26.8728	28.0160	28.9495	(42b)

Hot water usage for other uses

40.9194	39.4314	37.9435	36.4555	34.9675	33.4795	33.4795	34.9675	36.4555	37.9435	39.4314	40.9194	(42c)

Average daily hot water use (litres/day) 126.1438 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.2283	134.2981	130.7297	125.3034	120.8969	116.1596	114.3389	117.8920	121.6392	126.6126	132.1225	136.8724	(44)
Energy conte	217.3361	191.2388	200.9267	171.5341	162.7505	142.8318	138.2830	145.9749	149.9932	171.8120	188.2327	214.3091	(45)
Energy content (annual)										Total = Sum(45)m =		2095.2229	
Distribution loss (46)m = 0.15 x (45)m	32.6004	28.6858	30.1390	25.7301	24.4126	21.4248	20.7425	21.8962	22.4990	25.7718	28.2349	32.1464	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	263.9310	233.3245	247.5216	216.6259	209.3454	187.9236	184.8779	192.5698	195.0851	218.4069	233.3245	260.9040	(62)
WWHRS	-30.7490	-27.1947	-28.4767	-23.5798	-21.9755	-18.8046	-17.6263	-18.7438	-19.4560	-22.9365	-25.9842	-30.1796	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.1820	206.1298	219.0449	193.0461	187.3699	169.1190	167.2516	173.8259	175.6291	195.4705	207.3403	230.7245	(64)
										Total per year (kWh/year) = Sum(64)m =		2358.1335	(64)
12Total per year (kWh/year)												2358	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.5402	97.2555	104.0841	93.1086	91.3905	83.5650	83.2550	85.8126	85.9462	94.4034	98.6608	108.5337	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	128.3538	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7655	129.2761	116.7655	120.6577	116.7655	120.6577	116.7655	116.7655	120.6577	116.7655	120.6577	116.7655	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5428	233.9455	227.8908	215.0010	198.7301	183.4376	173.2214	170.8187	176.8734	189.7631	206.0341	221.3265	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	35.8354	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	(71)
Water heating gains (Table 5)													
	147.2314	144.7254	139.8979	129.3174	122.8366	116.0626	111.9019	115.3395	119.3698	126.8863	137.0289	145.8786	(72)
Total internal gains													
	560.0459	572.4531	549.0604	529.4824	502.8384	481.6640	463.3949	464.4298	478.4070	497.9211	528.2269	548.4768	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	12.8200	19.6403	0.6300	0.7000	0.7700	76.9497	(76)
Southeast	6.6200	36.7938	0.6300	0.7000	0.7700	74.4397	(77)

Solar gains	151.3895	277.3284	421.3926	576.5135	683.8700	692.6204	662.2871	582.1345	476.1739	318.7558	185.1089	126.9846	(83)
Total gains	711.4354	849.7816	970.4530	1105.9958	1186.7084	1174.2844	1125.6820	1046.5643	954.5809	816.6769	713.3358	675.4615	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.8927	69.0545	69.2138	69.9718	70.1155	70.7922	70.7922	70.9189	70.5300	70.1155	69.8254	69.5248	
alpha	5.5928	5.6036	5.6143	5.6648	5.6744	5.7195	5.7195	5.7279	5.7020	5.6744	5.6550	5.6350	
util living area													
	0.9962	0.9894	0.9694	0.8983	0.7495	0.5501	0.3997	0.4475	0.7033	0.9403	0.9906	0.9972	(86)
MIT	19.8933	20.1026	20.3884	20.7231	20.9220	20.9888	20.9985	20.9972	20.9586	20.6735	20.2203	19.8602	(87)
Th 2	19.8995	19.9018	19.9040	19.9146	19.9166	19.9258	19.9258	19.9275	19.9222	19.9166	19.9126	19.9084	(88)
util rest of house													
	0.9947	0.9854	0.9578	0.8637	0.6827	0.4621	0.3029	0.3447	0.6108	0.9112	0.9862	0.9960	(89)
MIT 2	18.6347	18.9016	19.2594	19.6600	19.8611	19.9208	19.9254	19.9268	19.8999	19.6174	19.0610	18.5990	(90)
Living area fraction										fLA = Living area / (4) =		0.3282	(91)
MIT	19.0478	19.2958	19.6300	20.0089	20.2093	20.2713	20.2776	20.2781	20.2474	19.9640	19.4415	19.0129	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0478	19.2958	19.6300	20.0089	20.2093	20.2713	20.2776	20.2781	20.2474	19.9640	19.4415	19.0129	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9824	0.9542	0.8671	0.7018	0.4909	0.3347	0.3786	0.6402	0.9128	0.9836	0.9947	(94)
Useful gains	706.5363	834.7979	925.9611	958.9809	832.7896	576.4910	376.8088	396.1881	611.1265	745.4474	701.6720	671.8831	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1554.7123	1514.0530	1377.7434	1153.0424	881.4071	581.8274	377.2923	397.1474	633.0167	969.9428	1283.6608	1547.3844	(97)
Space heating kWh													
	631.0430	456.4594	336.1261	139.7243	36.1714	0.0000	0.0000	0.0000	0.0000	167.0246	419.0319	651.3729	(98a)
Space heating requirement - total per year (kWh/year)												2836.9537	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	631.0430	456.4594	336.1261	139.7243	36.1714	0.0000	0.0000	0.0000	0.0000	167.0246	419.0319	651.3729	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2836.9537	
Space heating per m2											(98c) / (4) =	32.9840	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	631.0430	456.4594	336.1261	139.7243	36.1714	0.0000	0.0000	0.0000	0.0000	167.0246	419.0319	651.3729	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	683.6869	494.5389	364.1669	151.3806	39.1890	0.0000	0.0000	0.0000	0.0000	180.9584	453.9891	705.7128	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	233.1820	206.1298	219.0449	193.0461	187.3699	169.1190	167.2516	173.8259	175.6291	195.4705	207.3403	230.7245	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1776	85.7900	85.0169	83.3469	81.1305	79.8000	79.8000	79.8000	79.8000	83.7091	85.6042	86.2555	(217)
Fuel for water heating, kWh/month													
	270.5832	240.2727	257.6488	231.6177	230.9487	211.9285	209.5885	217.8270	220.0866	233.5115	242.2082	267.4896	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.2616	19.4635	17.5248	12.8394	9.9175	8.1027	9.0471	11.7597	15.2747	20.0413	22.6366	24.9359	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-22.8375	-33.7244	-50.7463	-59.8118	-66.8987	-63.3081	-62.5200	-57.8209	-49.9650	-39.7536	-25.6390	-19.5691	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6464	-18.5491	-37.5514	-57.4205	-76.9389	-77.6909	-76.7923	-64.5666	-46.7228	-26.8757	-11.6539	-6.8119	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3073.6227	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2833.7108	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	195.8048	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1062.8150	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5126.3233	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3073.6227	0.2100	645.4608	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2833.7108	0.2100	595.0793	(264)
Space and water heating			1240.5400	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	195.8048	0.1443	28.2607	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-552.5945	0.1336	-73.8424	
PV Unit electricity exported	-510.2204	0.1254	-63.9656	
Total			-137.8080	(269)
Total CO2, kg/year			1142.9219	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.2900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3073.6227	1.1300	3473.1936	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2833.7108	1.1300	3202.0932	(278)
Space and water heating			6675.2868	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	195.8048	1.5338	300.3319	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-552.5945	1.4938	-825.4737	
PV Unit electricity exported	-510.2204	0.4602	-234.7847	
Total			-1060.2583	(283)
Total Primary energy kWh/year			6045.4612	(286)
Target Primary Energy Rate (TPER)			70.2900	(287)

Full SAP Calculation Printout

Plot Reference	P-33	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-33
Plot Address	Flat 2, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.66	**TER**	13.29
Environmental	94 A	**% DER < TER**			49.89
CO_2 Emissions (t/year)	0.48	**DFEE**	38.82	**TFEE**	40.45
Compliance Check	See BREL	**% DFEE < TFEE**			4.04
% DPER < TPER	2.79	**DPER**	68.33	**TPER**	70.29

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	86.0100	(1b)	x 2.5500	(2b) =	219.3255	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0100					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	219.3255	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.3300 (17)
Infiltration rate		0.1165 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0990 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1263	0.1238	0.1213	0.1089	0.1065	0.0941	0.0941	0.0916	0.0990	0.1065	0.1114	0.1164	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.5300	1.1450	2.8969			(27)
Window			21.3100	1.1450	24.4008			(27)
Ground Floor			86.0100	0.1200	10.3212	110.0000	9461.1000	(28a)
Brickwork	65.3700	23.8400	41.5300	0.2100	8.7213	110.0000	4568.3003	(29a)
Communal Wall	22.4100	2.0600	20.3500	0.2100	4.2735	110.0000	2238.5000	(29a)
Stairwell Wall	19.3800		19.3800	0.1600	3.1008	110.0000	2131.7999	(29a)
Total net area of external elements Aum(A, m2)			193.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1865			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			86.0100			30.0000	2580.3000	(32b)
Internal Wall 1			229.0500			9.0000	2061.4500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26145.6501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		303.9838 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.0100	0.1120	3.8091
E7 Party floor between dwellings (in blocks of flats)	34.0100	0.0380	1.2924
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320
E4 Jamb	38.7400	0.0160	0.6198
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P1 Party wall - Ground floor	8.9600	0.1080	0.9677
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5297 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 63.7162 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	(38)
Heat transfer coeff	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	(39)
Average = Sum(39)m / 12 =												99.9049	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	(40)
HLP (average)												1.1616	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5671 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.2612	66.2504	64.7774	61.9592	59.8794	57.5601	56.2418	57.7036	59.3060	61.7963	64.6750	67.0035	(42a)
Hot water usage for baths	29.0477	28.6163	28.0088	26.8887	26.0500	25.1199	24.6176	25.2208	25.8777	26.8728	28.0160	28.9495	(42b)
Hot water usage for other uses	40.9194	39.4314	37.9435	36.4555	34.9675	33.4795	33.4795	34.9675	36.4555	37.9435	39.4314	40.9194	(42c)
Average daily hot water use (litres/day)												126.1438	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.2283	134.2981	130.7297	125.3034	120.8969	116.1596	114.3389	117.8920	121.6392	126.6126	132.1225	136.8724	(44)
Energy conte	217.3361	191.2388	200.9267	171.5341	162.7505	142.8318	138.2830	145.9749	149.9932	171.8120	188.2327	214.3091	(45)
Energy content (annual)										Total = Sum(45)m =		2095.2229	
Distribution loss (46)m = 0.15 x (45)m	32.6004	28.6858	30.1390	25.7301	24.4126	21.4248	20.7425	21.8962	22.4990	25.7718	28.2349	32.1464	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
										Total per year (kWh/year) = Sum(64)m =		2412.5539	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	72.2643	63.5869	66.8081	57.0351	54.1145	47.4916	45.9791	48.5366	49.8728	57.1275	62.5874	71.2578	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.1566	24.1202	19.6159	14.8505	11.1009	9.3719	10.1266	13.1630	17.6673	22.4327	26.1823	27.9113	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	345.5863	349.1724	340.1355	320.8971	296.6120	273.7875	258.5393	254.9532	263.9901	283.2285	307.5136	330.3381	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	(71)
Water heating gains (Table 5)	97.1294	94.6233	89.7959	79.2154	72.7346	65.9605	61.7999	65.2374	69.2677	76.7843	86.9269	95.7766	(72)
Total internal gains	574.1833	572.2270	553.8583	519.2740	484.7586	453.4309	434.7769	437.6647	455.2362	486.7566	524.9338	558.3371	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.5300	36.7938	0.3300	0.0000	0.7700	23.6538	(77)
East	15.7200	19.6403	0.3300	0.0000	0.7700	78.4521	(76)
Southeast	5.5900	36.7938	0.3300	0.0000	0.7700	52.2627	(77)

Solar gains	154.3685	282.7827	429.6742	587.8366	697.2973	706.2179	675.2896	593.5661	485.5295	325.0231	188.7509	129.4838	(83)
Total gains	728.5518	855.0097	983.5325	1107.1106	1182.0559	1159.6488	1110.0665	1031.2308	940.7657	811.7796	713.6847	687.8209	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	
alpha	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	
util living area	0.9955	0.9882	0.9641	0.8887	0.7351	0.5436	0.3949	0.4434	0.6967	0.9366	0.9900	0.9968	(86)
MIT	19.9978	20.1886	20.4682	20.7609	20.9360	20.9905	20.9987	20.9976	20.9639	20.7039	20.2751	19.9450	(87)
Th 2	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	(88)
util rest of house	0.9938	0.9838	0.9510	0.8527	0.6693	0.4583	0.3014	0.3436	0.6062	0.9067	0.9854	0.9955	(89)
MIT 2	18.8060	19.0474	19.3939	19.7328	19.9057	19.9466	19.9506	19.9503	19.9315	19.6806	19.1592	18.7388	(90)
Living area fraction										fLA = Living area / (4) =		0.3282	(91)
MIT	19.1972	19.4220	19.7465	20.0702	20.2439	20.2892	20.2946	20.2940	20.2703	20.0165	19.5254	19.1347	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1972	19.4220	19.7465	20.0702	20.2439	20.2892	20.2946	20.2940	20.2703	20.0165	19.5254	19.1347	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9808	0.9479	0.8573	0.6886	0.4862	0.3322	0.3765	0.6351	0.9089	0.9829	0.9941	(94)
Useful gains	722.7976	838.6160	932.2677	949.1430	813.9544	563.8642	368.7158	388.2191	597.4442	737.8382	701.4813	683.7933	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1488.3032	1450.8172	1323.3889	1115.9610	853.5738	568.3813	369.1103	389.0312	616.4461	940.7533	1241.3611	1492.0506	(97)
Space heating kWh	569.5362	411.3992	290.9942	120.1090	29.4769	0.0000	0.0000	0.0000	0.0000	150.9688	388.7135	601.3435	(98a)
Space heating requirement - total per year (kWh/year)												2562.5411	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	569.5362	411.3992	290.9942	120.1090	29.4769	0.0000	0.0000	0.0000	0.0000	150.9688	388.7135	601.3435	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2562.5411	
Space heating per m2											(98c) / (4) =	29.7935	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	569.5362	411.3992	290.9942	120.1090	29.4769	0.0000	0.0000	0.0000	0.0000	150.9688	388.7135	601.3435	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	569.5362	411.3992	290.9942	120.1090	29.4769	0.0000	0.0000	0.0000	0.0000	150.9688	388.7135	601.3435	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.2766	66.4310	70.2200	60.8949	58.4562	52.0503	50.9166	53.2868	54.2571	61.2484	66.0405	74.3438	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.7270	4.2695	4.7270	4.5745	4.7270	4.5745	4.7270	4.7270	4.5745	4.7270	4.5745	4.7270	(231)
Lighting	23.7700	19.0692	17.1697	12.5792	9.7166	7.9385	8.8638	11.5215	14.9653	19.6352	22.1779	24.4306	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2562.5411	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												743.4223	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	55.6560	(230a)
Total electricity for the above, kWh/year	55.6560	(231)
Electricity for lighting (calculated in Appendix L)	191.8375	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3553.4569	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2562.5411	16.4900	422.5630	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	743.4223	16.4900	122.5903	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	55.6560	16.4900	9.1777	(249)
Energy for lighting	191.8375	16.4900	31.6340	(250)
Additional standing charges			0.0000	(251)
Total energy cost			585.9650	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6102	(257)
SAP value		73.8993	
SAP rating (Section 12)		74	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2562.5411	0.1567	401.4934	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	743.4223	0.1412	104.9721	(264)
Space and water heating			506.4655	(265)
Pumps, fans and electric keep-hot	55.6560	0.1387	7.7202	(267)
Energy for lighting	191.8375	0.1443	27.6881	(268)
Total CO2, kg/year			541.8737	(272)
CO2 emissions per m2			6.3000	(273)
EI value			94.4576	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	86.0100	(1b) x	2.5500	(2b) =	219.3255	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.3255	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.3300	(17)

Infiltration rate	0.1165	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.0990	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1065	0.1015	0.1015	0.0941	0.0965	0.0842	0.0842	0.0817	0.0842	0.0941	0.0916	0.0990	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.5300	1.1450	2.8969			(27)
Window			21.3100	1.1450	24.4008			(27)
Ground Floor			86.0100	0.1200	10.3212	110.0000	9461.1000	(28a)
Brickwork	65.3700	23.8400	41.5300	0.2100	8.7213	110.0000	4568.3003	(29a)
Communal Wall	22.4100	2.0600	20.3500	0.2100	4.2735	110.0000	2238.5000	(29a)
Stairwell Wall	19.3800		19.3800	0.1600	3.1008	110.0000	2131.7999	(29a)
Total net area of external elements Aum(A, m2)			193.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1865			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			86.0100			30.0000	2580.3000	(32b)
Internal Wall 1			229.0500			9.0000	2061.4500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	26145.6501	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	303.9838	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.0100	0.1120	3.8091
E7 Party floor between dwellings (in blocks of flats)	34.0100	0.0380	1.2924
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320
E4 Jamb	38.7400	0.0160	0.6198
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P1 Party wall - Ground floor	8.9600	0.1080	0.9677
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.5297	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	63.7162	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	(38)
Heat transfer coeff	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	(39)
Average = Sum(39)m / 12 =												99.9049	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	(40)
HLP (average)												1.1616	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5671	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.2612	66.2504	64.7774	61.9592	59.8794	57.5601	56.2418	57.7036	59.3060	61.7963	64.6750	67.0035	(42a)

Hot water usage for baths

29.0477	28.6163	28.0088	26.8887	26.0500	25.1199	24.6176	25.2208	25.8777	26.8728	28.0160	28.9495	(42b)

Hot water usage for other uses

40.9194	39.4314	37.9435	36.4555	34.9675	33.4795	33.4795	34.9675	36.4555	37.9435	39.4314	40.9194	(42c)

Average daily hot water use (litres/day)	126.1438	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.2283	134.2981	130.7297	125.3034	120.8969	116.1596	114.3389	117.8920	121.6392	126.6126	132.1225	136.8724	(44)
Energy conte	217.3361	191.2388	200.9267	171.5341	162.7505	142.8318	138.2830	145.9749	149.9932	171.8120	188.2327	214.3091	(45)
Energy content (annual)										Total = Sum(45)m =		2095.2229	
Distribution loss (46)m = 0.15 x (45)m	32.6004	28.6858	30.1390	25.7301	24.4126	21.4248	20.7425	21.8962	22.4990	25.7718	28.2349	32.1464	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
									Total per year (kWh/year) = Sum(64)m =		2412.5539	(64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	72.2643	63.5869	66.8081	57.0351	54.1145	47.4916	45.9791	48.5366	49.8728	57.1275	62.5874	71.2578	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.1566	24.1202	19.6159	14.8505	11.1009	9.3719	10.1266	13.1630	17.6673	22.4327	26.1823	27.9113	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	345.5863	349.1724	340.1355	320.8971	296.6120	273.7875	258.5393	254.9532	263.9901	283.2285	307.5136	330.3381	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	(71)
Water heating gains (Table 5)													
	97.1294	94.6233	89.7959	79.2154	72.7346	65.9605	61.7999	65.2374	69.2677	76.7843	86.9269	95.7766	(72)
Total internal gains													
	574.1833	572.2270	553.8583	519.2740	484.7586	453.4309	434.7769	437.6647	455.2362	486.7566	524.9338	558.3371	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.5300	43.0593	0.3300	0.0000	0.7700	27.6816	(77)
East	15.7200	23.8018	0.3300	0.0000	0.7700	95.0750	(76)
Southeast	5.5900	43.0593	0.3300	0.0000	0.7700	61.1622	(77)

Solar gains	183.9189	294.6474	445.0095	619.0818	716.4584	768.0636	726.9730	654.4013	536.3765	363.6450	221.5857	155.1276	(83)
Total gains	758.1022	866.8744	998.8679	1138.3558	1201.2170	1221.4945	1161.7499	1092.0660	991.6127	850.4016	746.5195	713.4646	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	
alpha	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	
util living area													
	0.9930	0.9840	0.9501	0.8425	0.6503	0.4236	0.2837	0.3108	0.5915	0.8964	0.9829	0.9949	(86)
MIT	20.1119	20.2821	20.5646	20.8408	20.9701	20.9979	20.9998	20.9997	20.9863	20.8015	20.3996	20.0662	(87)
Th 2	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	(88)
util rest of house													
	0.9903	0.9777	0.9318	0.7954	0.5754	0.3391	0.1936	0.2150	0.4945	0.8508	0.9749	0.9928	(89)
MIT 2	18.9514	19.1652	19.5102	19.8164	19.9329	19.9502	19.9509	19.9509	19.9450	19.7863	19.3152	18.8936	(90)
Living area fraction									fLA = Living area / (4) =			0.3282	(91)
MIT	19.3323	19.5318	19.8563	20.1526	20.2733	20.2941	20.2952	20.2951	20.2868	20.1195	19.6711	19.2785	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3323	19.5318	19.8563	20.1526	20.2733	20.2941	20.2952	20.2951	20.2868	20.1195	19.6711	19.2785	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9880	0.9746	0.9298	0.8053	0.5991	0.3669	0.2231	0.2465	0.5263	0.8592	0.9722	0.9909	(94)
Useful gains	749.0254	844.8170	928.7855	916.7138	719.7024	448.1616	259.2378	269.1985	521.8827	730.6952	725.7293	706.9811	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1421.8777	1381.8647	1244.4457	1024.2846	736.6314	448.9791	259.2691	269.2550	528.1768	861.1290	1166.0038	1416.4975	(97)
Space heating kWh													
	500.6022	360.8961	234.8512	77.4510	12.5952	0.0000	0.0000	0.0000	0.0000	97.0427	316.9977	527.8802	(98a)
Space heating requirement - total per year (kWh/year)												2128.3162	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	500.6022	360.8961	234.8512	77.4510	12.5952	0.0000	0.0000	0.0000	0.0000	97.0427	316.9977	527.8802	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2128.3162	
Space heating per m2											(98c) / (4) =	24.7450	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	500.6022	360.8961	234.8512	77.4510	12.5952	0.0000	0.0000	0.0000	0.0000	97.0427	316.9977	527.8802	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	500.6022	360.8961	234.8512	77.4510	12.5952	0.0000	0.0000	0.0000	0.0000	97.0427	316.9977	527.8802	(211)

Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.2766	66.4310	70.2200	60.8949	58.4562	52.0503	50.9166	53.2868	54.2571	61.2484	66.0405	74.3438	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.7270	4.2695	4.7270	4.5745	4.7270	4.5745	4.7270	4.7270	4.5745	4.7270	4.5745	4.7270	(231)
Lighting	23.7700	19.0692	17.1697	12.5792	9.7166	7.9385	8.8638	11.5215	14.9653	19.6352	22.1779	24.4306	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2128.3162	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	743.4223	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	55.6560	(230a)
Total electricity for the above, kWh/year	55.6560	(231)
Electricity for lighting (calculated in Appendix L)	191.8375	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3119.2319	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2128.3162	27.6700	588.9051	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	743.4223	27.6700	205.7049	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	55.6560	27.6700	15.4000	(249)
Energy for lighting	191.8375	27.6700	53.0814	(250)
Additional standing charges			0.0000	(251)
Total energy cost			863.0915	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2128.3162	0.1575	335.1207	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	743.4223	0.1412	104.9721	(264)
Space and water heating			440.0928	(265)
Pumps, fans and electric keep-hot	55.6560	0.1387	7.7202	(267)
Energy for lighting	191.8375	0.1443	27.6881	(268)
Total CO2, kg/year			475.5011	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2128.3162	1.5829	3368.9022	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	743.4223	1.5221	1131.5821	(278)
Space and water heating			4500.4844	(279)
Pumps, fans and electric keep-hot	55.6560	1.5128	84.1965	(281)
Energy for lighting	191.8375	1.5338	294.2467	(282)
Total Primary energy kWh/year			4878.9276	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 74
Current environmental impact rating: A 94

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 74
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£863	£863	£0
Space heating	£604	£604	£0
Water heating	£206	£206	£0
Lighting	£53	£53	£0
Total cost of fuels	£863	£863	£0
Total cost of uses	£863	£863	£0
Delivered energy	36 kWh/m²	36 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	86.0100 (1b)	x	2.5500 (2b)	=	219.3255	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.3255	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.3300 (17)
Infiltration rate		0.1165 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0990 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1263	0.1238	0.1213	0.1089	0.1065	0.0941	0.0941	0.0916	0.0990	0.1065	0.1114	0.1164	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.5300	1.1450	2.8969			(27)
Window			21.3100	1.1450	24.4008			(27)
Ground Floor			86.0100	0.1200	10.3212	110.0000	9461.1000	(28a)
Brickwork	65.3700	23.8400	41.5300	0.2100	8.7213	110.0000	4568.3003	(29a)
Communal Wall	22.4100	2.0600	20.3500	0.2100	4.2735	110.0000	2238.5000	(29a)
Stairwell Wall	19.3800		19.3800	0.1600	3.1008	110.0000	2131.7999	(29a)
Total net area of external elements Aum(A, m2)			193.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1865			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			86.0100			30.0000	2580.3000	(32b)
Internal Wall 1			229.0500			9.0000	2061.4500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 26145.6501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 303.9838 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.0100	0.1120	3.8091
E7 Party floor between dwellings (in blocks of flats)	34.0100	0.0380	1.2924
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320
E4 Jamb	38.7400	0.0160	0.6198
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P1 Party wall - Ground floor	8.9600	0.1080	0.9677
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5297 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 63.7162 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	(38)
Heat transfer coeff	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	(39)
Average = Sum(39)m / 12 =												99.9049	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	(40)
HLP (average)												1.1616	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5671 (42)
Hot water usage for mixer showers

67.2612	66.2504	64.7774	61.9592	59.8794	57.5601	56.2418	57.7036	59.3060	61.7963	64.6750	67.0035	(42a)

Hot water usage for baths

29.0477	28.6163	28.0088	26.8887	26.0500	25.1199	24.6176	25.2208	25.8777	26.8728	28.0160	28.9495	(42b)

Hot water usage for other uses

40.9194	39.4314	37.9435	36.4555	34.9675	33.4795	33.4795	34.9675	36.4555	37.9435	39.4314	40.9194	(42c)

Average daily hot water use (litres/day) 126.1438 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.2283	134.2981	130.7297	125.3034	120.8969	116.1596	114.3389	117.8920	121.6392	126.6126	132.1225	136.8724	(44)
Energy conte	217.3361	191.2388	200.9267	171.5341	162.7505	142.8318	138.2830	145.9749	149.9932	171.8120	188.2327	214.3091	(45)
Energy content (annual)											Total = Sum(45)m =	2095.2229	
Distribution loss (46)m = 0.15 x (45)m	32.6004	28.6858	30.1390	25.7301	24.4126	21.4248	20.7425	21.8962	22.4990	25.7718	28.2349	32.1464	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
										Total per year (kWh/year) = Sum(64)m =		2412.5539	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	72.2643	63.5869	66.8081	57.0351	54.1145	47.4916	45.9791	48.5366	49.8728	57.1275	62.5874	71.2578	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.1566	24.1202	19.6159	14.8505	11.1009	9.3719	10.1266	13.1630	17.6673	22.4327	26.1823	27.9113	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	345.5863	349.1724	340.1355	320.8971	296.6120	273.7875	258.5393	254.9532	263.9901	283.2285	307.5136	330.3381	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	(71)
Water heating gains (Table 5)	97.1294	94.6233	89.7959	79.2154	72.7346	65.9605	61.7999	65.2374	69.2677	76.7843	86.9269	95.7766	(72)
Total internal gains	574.1833	572.2270	553.8583	519.2740	484.7586	453.4309	434.7769	437.6647	455.2362	486.7566	524.9338	558.3371	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.5300	36.7938	0.3300	0.0000	0.7700	23.6538	(77)
East	15.7200	19.6403	0.3300	0.0000	0.7700	78.4521	(76)
Southeast	5.5900	36.7938	0.3300	0.0000	0.7700	52.2627	(77)

Solar gains	154.3685	282.7827	429.6742	587.8366	697.2973	706.2179	675.2896	593.5661	485.5295	325.0231	188.7509	129.4838	(83)
Total gains	728.5518	855.0097	983.5325	1107.1106	1182.0559	1159.6488	1110.0665	1031.2308	940.7657	811.7796	713.6847	687.8209	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	
alpha	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	
util living area	0.9955	0.9882	0.9641	0.8887	0.7351	0.5436	0.3949	0.4434	0.6967	0.9366	0.9900	0.9968	(86)
MIT	19.9978	20.1886	20.4682	20.7609	20.9360	20.9905	20.9987	20.9976	20.9639	20.7039	20.2751	19.9450	(87)
Th 2	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	(88)
util rest of house	0.9938	0.9838	0.9510	0.8527	0.6693	0.4583	0.3014	0.3436	0.6062	0.9067	0.9854	0.9955	(89)
MIT 2	18.8060	19.0474	19.3939	19.7328	19.9057	19.9466	19.9506	19.9503	19.9315	19.6806	19.1592	18.7388	(90)
Living area fraction									fLA = Living area / (4) =			0.3282	(91)
MIT	19.1972	19.4220	19.7465	20.0702	20.2439	20.2892	20.2946	20.2940	20.2703	20.0165	19.5254	19.1347	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1972	19.4220	19.7465	20.0702	20.2439	20.2892	20.2946	20.2940	20.2703	20.0165	19.5254	19.1347	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9808	0.9479	0.8573	0.6886	0.4862	0.3322	0.3765	0.6351	0.9089	0.9829	0.9941	(94)
Useful gains	722.7976	838.6160	932.2677	949.1430	813.9544	563.8642	368.7158	388.2191	597.4442	737.8382	701.4813	683.7933	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1488.3032	1450.8172	1323.3889	1115.9610	853.5738	568.3813	369.1103	389.0312	616.4461	940.7533	1241.3611	1492.0506	(97)
Space heating kWh	569.5362	411.3992	290.9942	120.1090	29.4769	0.0000	0.0000	0.0000	0.0000	150.9688	388.7135	601.3435	(98a)
Space heating requirement - total per year (kWh/year)												2562.5411	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	569.5362	411.3992	290.9942	120.1090	29.4769	0.0000	0.0000	0.0000	0.0000	150.9688	388.7135	601.3435	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2562.5411	
Space heating per m2										(98c) / (4) =		29.7935	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	569.5362	411.3992	290.9942	120.1090	29.4769	0.0000	0.0000	0.0000	0.0000	150.9688	388.7135	601.3435	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	569.5362	411.3992	290.9942	120.1090	29.4769	0.0000	0.0000	0.0000	0.0000	150.9688	388.7135	601.3435	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.2766	66.4310	70.2200	60.8949	58.4562	52.0503	50.9166	53.2868	54.2571	61.2484	66.0405	74.3438	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.7270	4.2695	4.7270	4.5745	4.7270	4.5745	4.7270	4.7270	4.5745	4.7270	4.5745	4.7270	(231)
Lighting	23.7700	19.0692	17.1697	12.5792	9.7166	7.9385	8.8638	11.5215	14.9653	19.6352	22.1779	24.4306	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2562.5411	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	743.4223	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	55.6560	(230a)
Total electricity for the above, kWh/year	55.6560	(231)
Electricity for lighting (calculated in Appendix L)	191.8375	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3553.4569	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2562.5411	16.4900	422.5630	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	743.4223	16.4900	122.5903	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	55.6560	16.4900	9.1777	(249)
Energy for lighting	191.8375	16.4900	31.6340	(250)
Additional standing charges			0.0000	(251)
Total energy cost			585.9650	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6102	(257)
SAP value		73.8993	
SAP rating (Section 12)		74	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2562.5411	0.1567	401.4934	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	743.4223	0.1412	104.9721	(264)
Space and water heating			506.4655	(265)
Pumps, fans and electric keep-hot	55.6560	0.1387	7.7202	(267)
Energy for lighting	191.8375	0.1443	27.6881	(268)
Total CO2, kg/year			541.8737	(272)
CO2 emissions per m2			6.3000	(273)
EI value			94.4576	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		86.0100 (1b)	x	2.5500 (2b)	=	219.3255	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0100						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.3255	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.3300	(17)
Infiltration rate		0.1165	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0990	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1065	0.1015	0.1015	0.0941	0.0965	0.0842	0.0842	0.0817	0.0842	0.0941	0.0916	0.0990	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.5300	1.1450	2.8969			(27)
Window			21.3100	1.1450	24.4008			(27)
Ground Floor			86.0100	0.1200	10.3212	110.0000	9461.1000	(28a)
Brickwork	65.3700	23.8400	41.5300	0.2100	8.7213	110.0000	4568.3003	(29a)
Communal Wall	22.4100	2.0600	20.3500	0.2100	4.2735	110.0000	2238.5000	(29a)
Stairwell Wall	19.3800		19.3800	0.1600	3.1008	110.0000	2131.7999	(29a)
Total net area of external elements Aum(A, m2)			193.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.1865			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Ceiling 1			86.0100			30.0000	2580.3000	(32b)
Internal Wall 1			229.0500			9.0000	2061.4500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26145.6501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		303.9838 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	34.0100	0.1120	3.8091
E7 Party floor between dwellings (in blocks of flats)	34.0100	0.0380	1.2924
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E2 Other lintels (including other steel lintels)	10.6400	0.0500	0.5320
E4 Jamb	38.7400	0.0160	0.6198
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P1 Party wall - Ground floor	8.9600	0.1080	0.9677
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.5297 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	63.7162 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	36.1887	(38)
Heat transfer coeff	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	99.9049	(39)
Average = Sum(39)m / 12 =												99.9049	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	1.1616	(40)
HLP (average)												1.1616	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5671	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.2612	66.2504	64.7774	61.9592	59.8794	57.5601	56.2418	57.7036	59.3060	61.7963	64.6750	67.0035	(42a)
Hot water usage for baths	29.0477	28.6163	28.0088	26.8887	26.0500	25.1199	24.6176	25.2208	25.8777	26.8728	28.0160	28.9495	(42b)
Hot water usage for other uses	40.9194	39.4314	37.9435	36.4555	34.9675	33.4795	33.4795	34.9675	36.4555	37.9435	39.4314	40.9194	(42c)
Average daily hot water use (litres/day)												126.1438	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.2283	134.2981	130.7297	125.3034	120.8969	116.1596	114.3389	117.8920	121.6392	126.6126	132.1225	136.8724	(44)
Energy conte	217.3361	191.2388	200.9267	171.5341	162.7505	142.8318	138.2830	145.9749	149.9932	171.8120	188.2327	214.3091	(45)
Energy content (annual)										Total = Sum(45)m =		2095.2229	

Distribution loss (46)m = 0.15 x (45)m

	32.6004	28.6858	30.1390	25.7301	24.4126	21.4248	20.7425	21.8962	22.4990	25.7718	28.2349	32.1464 (46)

Water storage loss (or HIU loss):

Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605 (64)
									Total per year (kWh/year) = Sum(64)m =			2412.5539 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000 (64a)
Heat gains from water heating, kWh/month												
	72.2643	63.5869	66.8081	57.0351	54.1145	47.4916	45.9791	48.5366	49.8728	57.1275	62.5874	71.2578 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	154.0246	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.1566	24.1202	19.6159	14.8505	11.1009	9.3719	10.1266	13.1630	17.6673	22.4327	26.1823	27.9113	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	345.5863	349.1724	340.1355	320.8971	296.6120	273.7875	258.5393	254.9532	263.9901	283.2285	307.5136	330.3381	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	52.9695	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	-102.6830	(71)
Water heating gains (Table 5)													
	97.1294	94.6233	89.7959	79.2154	72.7346	65.9605	61.7999	65.2374	69.2677	76.7843	86.9269	95.7766	(72)
Total internal gains													
	574.1833	572.2270	553.8583	519.2740	484.7586	453.4309	434.7769	437.6647	455.2362	486.7566	524.9338	558.3371	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.5300	43.0593	0.3300	0.0000	0.7700	27.6816	(77)
East	15.7200	23.8018	0.3300	0.0000	0.7700	95.0750	(76)
Southeast	5.5900	43.0593	0.3300	0.0000	0.7700	61.1622	(77)

Solar gains	183.9189	294.6474	445.0095	619.0818	716.4584	768.0636	726.9730	654.4013	536.3765	363.6450	221.5857	155.1276	(83)
Total gains	758.1022	866.8744	998.8679	1138.3558	1201.2170	1221.4945	1161.7499	1092.0660	991.6127	850.4016	746.5195	713.4646	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	72.6959	
alpha	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	5.8464	
util living area													
	0.9930	0.9840	0.9501	0.8425	0.6503	0.4236	0.2837	0.3108	0.5915	0.8964	0.9829	0.9949	(86)
MIT	20.1119	20.2821	20.5646	20.8408	20.9701	20.9979	20.9998	20.9997	20.9863	20.8015	20.3996	20.0662	(87)
Th 2	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	19.9509	(88)
util rest of house													
	0.9903	0.9777	0.9318	0.7954	0.5754	0.3391	0.1936	0.2150	0.4945	0.8508	0.9749	0.9928	(89)
MIT 2	18.9514	19.1652	19.5102	19.8164	19.9329	19.9502	19.9509	19.9509	19.9450	19.7863	19.3152	18.8936	(90)
Living area fraction									fLA = Living area / (4) =			0.3282	(91)
MIT	19.3323	19.5318	19.8563	20.1526	20.2733	20.2941	20.2952	20.2951	20.2868	20.1195	19.6711	19.2785	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3323	19.5318	19.8563	20.1526	20.2733	20.2941	20.2952	20.2951	20.2868	20.1195	19.6711	19.2785	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9880	0.9746	0.9298	0.8053	0.5991	0.3669	0.2231	0.2465	0.5263	0.8592	0.9722	0.9909	(94)
Useful gains	749.0254	844.8170	928.7855	916.7138	719.7024	448.1616	259.2378	269.1985	521.8827	730.6952	725.7293	706.9811	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1421.8777	1381.8647	1244.4457	1024.2846	736.6314	448.9791	259.2691	269.2550	528.1768	861.1290	1166.0038	1416.4975	(97)
Space heating kWh													
	500.6022	360.8961	234.8512	77.4510	12.5952	0.0000	0.0000	0.0000	0.0000	97.0427	316.9977	527.8802	(98a)
Space heating requirement - total per year (kWh/year)												2128.3162	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	500.6022	360.8961	234.8512	77.4510	12.5952	0.0000	0.0000	0.0000	0.0000	97.0427	316.9977	527.8802	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2128.3162	

Space heating per m2 (98c) / (4) = 24.7450 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	500.6022	360.8961	234.8512	77.4510	12.5952	0.0000	0.0000	0.0000	0.0000	97.0427	316.9977	527.8802	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	500.6022	360.8961	234.8512	77.4510	12.5952	0.0000	0.0000	0.0000	0.0000	97.0427	316.9977	527.8802	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	244.2875	215.5820	227.8781	197.6161	189.7019	168.9138	165.2344	172.9263	176.0752	198.7634	214.3147	241.2605	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.2766	66.4310	70.2200	60.8949	58.4562	52.0503	50.9166	53.2868	54.2571	61.2484	66.0405	74.3438	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.7270	4.2695	4.7270	4.5745	4.7270	4.5745	4.7270	4.7270	4.5745	4.7270	4.5745	4.7270	(231)
Lighting	23.7700	19.0692	17.1697	12.5792	9.7166	7.9385	8.8638	11.5215	14.9653	19.6352	22.1779	24.4306	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2128.3162 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	743.4223 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)	
mechanical ventilation fans (SFP = 0.2080)	55.6560 (230a)
Total electricity for the above, kWh/year	55.6560 (231)
Electricity for lighting (calculated in Appendix L)	191.8375 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3119.2319 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2128.3162	27.6700	588.9051	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	743.4223	27.6700	205.7049	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	55.6560	27.6700	15.4000	(249)
Energy for lighting	191.8375	27.6700	53.0814	(250)
Additional standing charges			0.0000	(251)
Total energy cost			863.0915	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2128.3162	0.1575	335.1207	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	743.4223	0.1412	104.9721	(264)
Space and water heating			440.0928	(265)

Pumps, fans and electric keep-hot	55.6560	0.1387	7.7202 (267)
Energy for lighting	191.8375	0.1443	27.6881 (268)
Total CO2, kg/year			475.5011 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2128.3162	1.5829	3368.9022	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	743.4223	1.5221	1131.5821	(278)
Space and water heating			4500.4844	(279)
Pumps, fans and electric keep-hot	55.6560	1.5128	84.1965	(281)
Energy for lighting	191.8375	1.5338	294.2467	(282)
Total Primary energy kWh/year			4878.9276	(286)

Summary for Input Data

Plot Reference	P-34	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-34
Plot Address	Flat 3, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	76 C	**DER**	6.73	**TER**	13.88
Environmental	95 A	**% DER < TER**			51.51
CO_2 Emissions (t/year)	0.39	**DFEE**	38.47	**TFEE**	38.06
Compliance Check	See BREL	**% DFEE < TFEE**			-1.09
% DPER < TPER	6.07	**DPER**	69.14	**TPER**	73.60

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	22.17 m	68.26 m²	2.55 m

8.0 Living Area	24.42	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	62.87	42.04	0.00	None	20.83	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.97	4.91	0.70	Stairwell Access Corridor 3	2.06	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	43.57	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	181.81

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	68.26

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)

Summary for Input Data

Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	68.26

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Patio Door	Brickwork	North	5.59	
South East	Window	Brickwork	South East	5.45	
West	Window	Brickwork	West	9.79	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	22.17	0.11	0.11	RCD	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	22.17	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	6.30	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	3.15	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	9.45	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	13.84	0.11	0.11		No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	13.84	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	9.63	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	33.00	0.02	0.02	RCD	Yes

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes	
Approved Installation	Yes	
Mechanical Ventilation data Type	Database	
Type	Mechanical extract ventilation - centralised	
MV Reference Number	500107	
Configuration	2	
Manufacturer SFP	0.16	
Duct Type	Rigid	
Wet Rooms	2	

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	

21.0 Fixed Cooling System	No	

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

Summary for Input Data

elmhurst energy

As Built AP_{50}	3.11	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	10
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day
34.0 Small-scale Hydro	None	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-34	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-34
Plot Address	Flat 3, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	76 C	**DER**	6.73	**TER**	13.88
Environmental	95 A	**% DER < TER**			51.51
CO_2 Emissions (t/year)	0.39	**DFEE**	38.47	**TFEE**	38.06
Compliance Check	See BREL	**% DFEE < TFEE**			-1.09
% DPER < TPER	6.07	**DPER**	69.14	**TPER**	73.60

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.1100	(17)
Infiltration rate			0.1555	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1322	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1685	0.1652	0.1619	0.1454	0.1421	0.1256	0.1256	0.1223	0.1322	0.1421	0.1487	0.1553	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			15.2400	1.1450	17.4504			(27)
Ground Floor			68.2600	0.1200	8.1912	110.0000	7508.6000	(28a)
Brickwork	62.8700	20.8300	42.0400	0.2100	8.8284	110.0000	4624.3999	(29a)
Communal Wall	6.9700	2.0600	4.9100	0.2100	1.0311	110.0000	540.1000	(29a)
Total net area of external elements Aum(A, m2)			138.1000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.3738			(33)
Main dwelling								
Party Wall 1			43.5700	0.0000	0.0000	110.0000	4792.7000	(32)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			181.8100			9.0000	1636.2900	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21149.8898	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							309.8431	(35)
List of Thermal Bridges								

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	22.1700	0.1120	2.4830
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425
E16 Corner (normal)	6.3000	0.0540	0.3402
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055
E18 Party wall between dwellings	9.4500	0.0380	0.3591
P1 Party wall - Ground floor	13.8400	0.1080	1.4947
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0160	0.5280

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.2235 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.5973 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	(39)
Average = Sum(39)m / 12 =												79.3177	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	(40)
HLP (average)												1.1620	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)
Hot water usage for mixer showers

61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)											Total = Sum(45)m =	1905.0938	
Distribution loss (46)m = 0.15 x (45)m													
	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
									Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
12Total per year (kWh/year)												2222	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4484	107.8893	97.4484	100.6967	97.4484	100.6967	97.4484	97.4484	100.6967	97.4484	100.6967	97.4484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains	435.0134	445.1807	425.2984	408.1709	385.4533	369.7820	354.2259	355.3466	367.3114	381.6530	407.7002	425.2587	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.5900	10.6334	0.3300	0.0000	0.7700	15.1039	(74)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	114.9155	211.2338	325.2023	455.4844	552.2729	565.2276	538.0020	464.2386	370.6200	243.6934	140.5835	96.3755	(83)
Total gains	549.9289	656.4145	750.5007	863.6554	937.7261	935.0096	892.2279	819.5851	737.9315	625.3464	548.2837	521.6342	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	
alpha	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	
util living area	0.9968	0.9906	0.9709	0.8969	0.7369	0.5362	0.3902	0.4431	0.7045	0.9453	0.9920	0.9977	(86)
MIT	19.9766	20.1738	20.4445	20.7560	20.9385	20.9917	20.9989	20.9978	20.9639	20.6919	20.2637	19.9295	(87)
Th 2	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	(88)
util rest of house	0.9956	0.9869	0.9598	0.8621	0.6707	0.4516	0.2977	0.3432	0.6134	0.9179	0.9882	0.9967	(89)
MIT 2	18.7769	19.0271	19.3644	19.7274	19.9075	19.9469	19.9503	19.9500	19.9312	19.6670	19.1430	18.7169	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.2061	19.4373	19.7508	20.0953	20.2763	20.3207	20.3254	20.3248	20.3006	20.0336	19.5439	19.1507	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2061	19.4373	19.7508	20.0953	20.2763	20.3207	20.3254	20.3248	20.3006	20.0336	19.5439	19.1507	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9943	0.9845	0.9572	0.8675	0.6922	0.4819	0.3309	0.3791	0.6452	0.9205	0.9862	0.9957	(94)
Useful gains	546.7900	646.2447	718.3434	749.2027	649.1282	450.5408	295.2140	310.6926	476.1374	575.6393	540.7289	519.3993	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1182.3174	1153.0672	1051.0225	887.9892	680.2532	453.7528	295.4934	311.3091	491.8206	748.2530	987.0214	1185.8564	(97)
Space heating kWh	472.8324	340.5847	247.5132	99.9262	23.1570	0.0000	0.0000	0.0000	0.0000	128.4246	321.3306	495.8441	(98a)
Space heating requirement - total per year (kWh/year)												2129.6128	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	472.8324	340.5847	247.5132	99.9262	23.1570	0.0000	0.0000	0.0000	0.0000	128.4246	321.3306	495.8441	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2129.6128	
Space heating per m2											(98c) / (4) =	31.1985	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	472.8324	340.5847	247.5132	99.9262	23.1570	0.0000	0.0000	0.0000	0.0000	128.4246	321.3306	495.8441	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	472.8324	340.5847	247.5132	99.9262	23.1570	0.0000	0.0000	0.0000	0.0000	128.4246	321.3306	495.8441	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2129.6128	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												684.8345	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3018.6893	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2129.6128	0.1566	333.5902	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			430.2675	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			459.4978	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.7300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2129.6128	1.5799	3364.5688	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			4406.8902	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			4719.2343	(286)
Dwelling Primary energy Rate (DPER)			69.1400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1149	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3649	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3102	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3644	(22b)
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			15.0200	1.1450	17.1985			(27)
Ground Floor			68.2600	0.1300	8.8738			(28a)
Brickwork	62.8700	15.0200	47.8500	0.1800	8.6130			(29a)
Communal Wall	6.9700	2.0600	4.9100	0.1800	0.8838			(29a)
Total net area of external elements Aum(A, m2)			138.1000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6291			(33)
Main dwelling								
Party Wall 1			43.5700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 309.8431 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	22.1700	0.1600	3.5472
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0700	1.5519
E16 Corner (normal)	6.3000	0.0900	0.5670
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0900	-0.2835
E18 Party wall between dwellings	9.4500	0.0600	0.5670
P1 Party wall - Ground floor	13.8400	0.0800	1.1072
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0500	1.6500

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1883 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.8174 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.2120	33.0376	32.8666	32.0636	31.9134	31.2140	31.2140	31.0845	31.4834	31.9134	32.2173	32.5350	(38)
Heat transfer coeff	80.0293	79.8549	79.6840	78.8810	78.7307	78.0314	78.0314	77.9018	78.3008	78.7307	79.0347	79.3524	(39)
Average = Sum(39)m / 12 =												78.8803	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1724	1.1699	1.1674	1.1556	1.1534	1.1431	1.1431	1.1413	1.1471	1.1534	1.1578	1.1625	(40)
HLP (average)												1.1556	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)
Average daily hot water use (litres/day)												114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	244.2086	215.9707	229.2891	201.0606	194.5772	174.9630	172.3298	179.3233	181.4738	202.8156	216.2432	241.4563	(62)
WWHRS	-27.9594	-24.7276	-25.8933	-21.4407	-19.9819	-17.0987	-16.0273	-17.0434	-17.6909	-20.8557	-23.6270	-27.4417	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
										Total per year (kWh/year) = Sum(64)m =		2193.9237	(64)
12Total per year (kWh/year)												2194	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.9825	91.4853	98.0217	87.9331	86.4800	79.2556	79.0828	81.4081	81.4205	89.2193	92.9813	102.0673	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4814	107.9259	97.4814	100.7308	97.4814	100.7308	97.4814	97.4814	100.7308	97.4814	100.7308	97.4814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)													

	138.4173	136.1389	131.7496	122.1293	116.2366	110.0773	106.2940	109.4195	113.0840	119.9184	129.1407	137.1873	(72)
Total internal gains	488.1484	498.3193	478.4335	461.3071	438.5883	419.9181	404.3609	405.4816	417.4475	434.7880	460.8363	478.3938	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.0300	10.6334	0.6300	0.7000	0.7700	13.0963	(74)
Southeast	3.9300	36.7938	0.6300	0.7000	0.7700	44.1916	(77)
West	7.0600	19.6403	0.6300	0.7000	0.7700	42.3764	(80)

Solar gains	99.6642	183.1995	282.0420	395.0318	478.9723	490.2066	466.5950	402.6234	321.4316	211.3512	121.9256	83.5848	(83)
Total gains	587.8127	681.5188	760.4755	856.3389	917.5606	910.1247	870.9559	808.1050	738.8791	646.1392	582.7620	561.9785	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.4102	73.5705	73.7284	74.4789	74.6210	75.2898	75.2898	75.4150	75.0308	74.6210	74.3341	74.0364	
alpha	5.8940	5.9047	5.9152	5.9653	5.9747	6.0193	6.0193	6.0277	6.0021	5.9747	5.9556	5.9358	
util living area	0.9956	0.9888	0.9695	0.8985	0.7452	0.5419	0.3933	0.4416	0.6974	0.9366	0.9891	0.9966	(86)
MIT	20.0113	20.1946	20.4493	20.7559	20.9361	20.9918	20.9990	20.9980	20.9670	20.7181	20.3113	19.9811	(87)
Th 2	19.9421	19.9442	19.9462	19.9557	19.9575	19.9658	19.9658	19.9673	19.9626	19.9575	19.9539	19.9501	(88)
util rest of house	0.9938	0.9845	0.9579	0.8641	0.6796	0.4577	0.3014	0.3435	0.6073	0.9063	0.9841	0.9952	(89)
MIT 2	18.8147	19.0481	19.3665	19.7320	19.9124	19.9622	19.9655	19.9668	19.9450	19.7016	19.2051	18.7823	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.2428	19.4583	19.7539	20.0983	20.2786	20.3305	20.3352	20.3357	20.3106	20.0652	19.6008	19.2111	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2428	19.4583	19.7539	20.0983	20.2786	20.3305	20.3352	20.3357	20.3106	20.0652	19.6008	19.2111	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9819	0.9553	0.8694	0.7008	0.4878	0.3343	0.3787	0.6389	0.9100	0.9819	0.9939	(94)
Useful gains	583.2334	669.1663	726.4529	744.4779	643.0069	443.9830	291.1993	306.0464	472.0345	588.0178	572.1886	558.5244	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1195.8589	1162.5487	1056.1220	883.3326	675.4023	447.1606	291.4661	306.5996	486.2965	745.2039	988.0003	1191.1695	(97)
Space heating kWh	455.7934	331.5530	245.2738	99.9754	24.1022	0.0000	0.0000	0.0000	0.0000	116.9464	299.3844	470.6879	(98a)
Space heating requirement - total per year (kWh/year)												2043.7167	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	455.7934	331.5530	245.2738	99.9754	24.1022	0.0000	0.0000	0.0000	0.0000	116.9464	299.3844	470.6879	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2043.7167	
Space heating per m2										(98c) / (4) =		29.9402	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.7934	331.5530	245.2738	99.9754	24.1022	0.0000	0.0000	0.0000	0.0000	116.9464	299.3844	470.6879	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	493.8174	359.2123	265.7355	108.3158	26.1129	0.0000	0.0000	0.0000	0.0000	126.7025	324.3602	509.9544	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6902	85.2816	84.4807	82.8007	80.7933	79.8000	79.8000	79.8000	79.8000	83.0950	85.0450	85.7762	(217)
Fuel for water heating, kWh/month	252.3616	224.2491	240.7601	216.9303	216.1013	197.8249	195.8678	203.3583	205.2416	218.9782	226.4875	249.5034	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.2547	16.2491	14.6305	10.7189	8.2796	6.7645	7.5529	9.8176	12.7521	16.7314	18.8981	20.8177	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3097	-27.1386	-40.9912	-48.5120	-54.4467	-51.6084	-50.9824	-47.0686	-40.5400	-32.0902	-20.5958	-15.6793	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.6768	-14.3472	-29.0843	-44.5269	-59.7069	-60.2925	-59.5798	-50.0617	-36.1942	-20.7887	-9.0010	-5.2575 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2214.2110	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2647.6641	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	163.4671	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-843.4804	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4267.8618	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2214.2110	0.2100	464.9843	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2647.6641	0.2100	556.0095	(264)
Space and water heating			1020.9938	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.4671	0.1443	23.5934	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9630	0.1335	-59.8221	
PV Unit electricity exported	-395.5175	0.1253	-49.5744	
Total			-109.3964	(269)
Total CO2, kg/year			947.1200	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2214.2110	1.1300	2502.0584	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2647.6641	1.1300	2991.8604	(278)
Space and water heating			5493.9188	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.4671	1.5338	250.7313	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9630	1.4935	-669.0286	
PV Unit electricity exported	-395.5175	0.4601	-181.9615	
Total			-850.9901	(283)
Total Primary energy kWh/year			5023.7608	(286)
Target Primary Energy Rate (TPER)			73.6000	(287)

Full SAP Calculation Printout

Plot Reference	P-34	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-34
Plot Address	Flat 3, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	76 C	**DER**	6.73	**TER**	13.88
Environmental	95 A	**% DER < TER**			51.51
CO_2 Emissions (t/year)	0.39	**DFEE**	38.47	**TFEE**	38.06
Compliance Check	See BREL	**% DFEE < TFEE**			-1.09
% DPER < TPER	6.07	**DPER**	69.14	**TPER**	73.60

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1149	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1100	(17)
Infiltration rate		0.2704	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2298	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2930	0.2873	0.2816	0.2528	0.2471	0.2183	0.2183	0.2126	0.2298	0.2471	0.2586	0.2701	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5429	0.5413	0.5396	0.5320	0.5305	0.5238	0.5238	0.5226	0.5264	0.5305	0.5334	0.5365	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			15.2400	1.1450	17.4504			(27)
Ground Floor			68.2600	0.1200	8.1912	110.0000	7508.6000	(28a)
Brickwork	62.8700	20.8300	42.0400	0.2100	8.8284	110.0000	4624.3999	(29a)
Communal Wall	6.9700	2.0600	4.9100	0.2100	1.0311	110.0000	540.1000	(29a)
Total net area of external elements Aum(A, m2)			138.1000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.3738			(33)
Main dwelling								
Party Wall 1			43.5700	0.0000	0.0000	110.0000	4792.7000	(32)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			181.8100			9.0000	1636.2900	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21149.8898	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							309.8431	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	22.1700	0.1120	2.4830

E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425	
E16 Corner (normal)	6.3000	0.0540	0.3402	
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055	
E18 Party wall between dwellings	9.4500	0.0380	0.3591	
P1 Party wall - Ground floor	13.8400	0.1080	1.4947	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815	
E4 Jamb	33.0000	0.0160	0.5280	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.2235 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	50.5973 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.1868	31.0910	30.9972	30.5562	30.4737	30.0897	30.0897	30.0186	30.2376	30.4737	30.6406	30.8151	(38)
Heat transfer coeff	81.7841	81.6883	81.5945	81.1535	81.0710	80.6870	80.6870	80.6159	80.8349	81.0710	81.2379	81.4124	(39)
Average = Sum(39)m / 12 =												81.1531	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1981	1.1967	1.1953	1.1889	1.1877	1.1821	1.1821	1.1810	1.1842	1.1877	1.1901	1.1927	(40)
HLP (average)												1.1889	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 58.3103 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.6162	61.8713	59.9662	57.5948	55.4794	53.2809	52.8240	54.7252	56.6751	58.9328	61.3252	63.5268	(44)
Energy conte	100.7525	88.1039	92.1658	78.8444	74.6859	65.5151	63.8860	67.7612	69.8861	79.9713	87.3690	99.4677	(45)
Energy content (annual)										Total = Sum(45)m =		968.4090	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(64)
										Total per year (kWh/year) = Sum(64)m =		823.1476	(64)
12Total per year (kWh/year)												823	(64)
Electric shower(s)	48.9784	43.6401	47.6533	45.4750	46.3283	44.1927	45.6658	46.3283	45.4750	47.6533	46.7573	48.9784	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		557.1259	(64a)
Heat gains from water heating, kWh/month	33.6545	29.6321	31.4986	28.1232	27.4528	24.9701	24.9922	25.9813	26.2195	28.9072	30.2552	33.3815	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4484	107.8893	97.4484	100.6967	97.4484	100.6967	97.4484	97.4484	100.6967	97.4484	100.6967	97.4484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	45.2345	44.0954	42.3368	39.0600	36.8990	34.6808	33.5917	34.9211	36.4160	38.8538	42.0212	44.8676	(72)
Total internal gains	391.9326	403.2392	385.9876	375.2037	356.2177	344.4875	331.6256	330.9502	340.7455	350.6904	370.6827	383.0411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.5900	10.6334	0.3300	0.0000	0.7700	15.1039	(74)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	114.9155	211.2338	325.2023	455.4844	552.2729	565.2276	538.0020	464.2386	370.6200	243.6934	140.5835	96.3755	(83)
Total gains	506.8481	614.4730	711.1899	830.6881	908.4906	909.7151	869.6276	795.1888	711.3655	594.3838	511.2662	479.4165	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.8351	71.9193	72.0021	72.3933	72.4669	72.8119	72.8119	72.8761	72.6786	72.4669	72.3181	72.1631	
alpha	5.7890	5.7946	5.8001	5.8262	5.8311	5.8541	5.8541	5.8584	5.8452	5.8311	5.8212	5.8109	
util living area	0.9980	0.9935	0.9785	0.9146	0.7638	0.5585	0.4070	0.4635	0.7337	0.9577	0.9945	0.9985	(86)
MIT	19.8727	20.0760	20.3610	20.7083	20.9212	20.9891	20.9985	20.9970	20.9529	20.6404	20.1853	19.8336	(87)
Th 2	19.9215	19.9226	19.9237	19.9289	19.9299	19.9344	19.9344	19.9352	19.9326	19.9299	19.9279	19.9259	(88)
util rest of house	0.9971	0.9908	0.9697	0.8834	0.6977	0.4700	0.3092	0.3578	0.6413	0.9349	0.9919	0.9979	(89)
MIT 2	18.9093	19.1119	19.3918	19.7172	19.8861	19.9306	19.9341	19.9346	19.9126	19.6664	19.2257	18.8739	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.2539	19.4568	19.7385	20.0718	20.2564	20.3093	20.3149	20.3147	20.2848	20.0148	19.5690	19.2172	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2539	19.4568	19.7385	20.0718	20.2564	20.3093	20.3149	20.3147	20.2848	20.0148	19.5690	19.2172	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9964	0.9893	0.9679	0.8881	0.7191	0.5017	0.3442	0.3958	0.6736	0.9371	0.9907	0.9974	(94)
Useful gains	505.0327	607.9244	688.3450	737.7304	653.2577	456.3921	299.3609	314.7373	479.1789	557.0195	506.4905	478.1496	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1222.9931	1189.1221	1080.1905	906.6312	693.6757	460.6666	299.7459	315.5865	499.9445	763.2706	1012.9575	1222.5879	(97)
Space heating kWh	534.1626	390.5648	291.5331	121.6086	30.0710	0.0000	0.0000	0.0000	0.0000	153.4508	364.6562	553.8621	(98a)
Space heating requirement - total per year (kWh/year)												2439.9091	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	534.1626	390.5648	291.5331	121.6086	30.0710	0.0000	0.0000	0.0000	0.0000	153.4508	364.6562	553.8621	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2439.9091	
Space heating per m2										(98c) / (4) =		35.7443	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	758.4577	597.0837	612.6806	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9493	0.9780	0.9633	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	719.9816	583.9242	590.1952	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1026.7998	981.8520	896.7346	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	220.9091	296.0582	228.0653	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.2273	74.0146	57.0163	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												186.2582	(107)
Energy for space heating												35.7443	(99)
Energy for space cooling												2.7287	(108)
Total												38.4730	(109)
Fabric Energy Efficiency (DFEE)												38.5	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1149 (8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3649	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3102	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3644	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			15.0200	1.1450	17.1985			(27)
Ground Floor			68.2600	0.1300	8.8738			(28a)
Brickwork	62.8700	15.0200	47.8500	0.1800	8.6130			(29a)
Communal Wall	6.9700	2.0600	4.9100	0.1800	0.8838			(29a)
Total net area of external elements Aum(A, m2)			138.1000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.6291			(33)
Main dwelling								
Party Wall 1			43.5700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	309.8431	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	22.1700	0.1600	3.5472
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0700	1.5519
E16 Corner (normal)	6.3000	0.0900	0.5670
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0900	-0.2835
E18 Party wall between dwellings	9.4500	0.0600	0.5670
P1 Party wall - Ground floor	13.8400	0.0800	1.1072
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0500	1.6500

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.1883	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	46.8174	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.2120	33.0376	32.8666	32.0636	31.9134	31.2140	31.2140	31.0845	31.4834	31.9134	32.2173	32.5350	(38)
Heat transfer coeff	80.0293	79.8549	79.6840	78.8810	78.7307	78.0314	78.0314	77.9018	78.3008	78.7307	79.0347	79.3524	(39)
Average = Sum(39)m / 12 =												78.8803	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1724	1.1699	1.1674	1.1556	1.1534	1.1431	1.1431	1.1413	1.1471	1.1534	1.1578	1.1625	(40)
HLP (average)												1.1556	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2032	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day)	58.3103	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.6162	61.8713	59.9662	57.5948	55.4794	53.2809	52.8240	54.7252	56.6751	58.9328	61.3252	63.5268	(44)
Energy conte	100.7525	88.1039	92.1658	78.8444	74.6859	65.5151	63.8860	67.7612	69.8861	79.9713	87.3690	99.4677	(45)

Energy content (annual) Total = Sum(45)m =	968.4090	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(64)

Total per year (kWh/year) = Sum(64)m =	823.1476	(64)
12Total per year (kWh/year)	823	(64)

Electric shower(s)

48.9784	43.6401	47.6533	45.4750	46.3283	44.1927	45.6658	46.3283	45.4750	47.6533	46.7573	48.9784	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	557.1259	(64a)

Heat gains from water heating, kWh/month

33.6545	29.6321	31.4986	28.1232	27.4528	24.9701	24.9922	25.9813	26.2195	28.9072	30.2552	33.3815	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	97.4814	107.9259	97.4814	100.7308	97.4814	100.7308	97.4814	97.4814	100.7308	97.4814	100.7308	97.4814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)													
	45.2345	44.0954	42.3368	39.0600	36.8990	34.6808	33.5917	34.9211	36.4160	38.8538	42.0212	44.8676	(72)
Total internal gains													
	391.9656	403.2758	386.0206	375.2378	356.2507	344.5216	331.6586	330.9832	340.7796	350.7234	370.7168	383.0741	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.0300	10.6334	0.6300	0.7000	0.7700	13.0963	(74)
Southeast	3.9300	36.7938	0.6300	0.7000	0.7700	44.1916	(77)
West	7.0600	19.6403	0.6300	0.7000	0.7700	42.3764	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	99.6642	183.1995	282.0420	395.0318	478.9723	490.2066	466.5950	402.6234	321.4316	211.3512	121.9256	83.5848	(83)
Total gains	491.6299	586.4752	668.0626	770.2696	835.2230	834.7282	798.2536	733.6066	662.2112	562.0745	492.6425	466.6588	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.4102	73.5705	73.7284	74.4789	74.6210	75.2898	75.2898	75.4150	75.0308	74.6210	74.3341	74.0364	
alpha	5.8940	5.9047	5.9152	5.9653	5.9747	6.0193	6.0193	6.0277	6.0021	5.9747	5.9556	5.9358	
util living area													
	0.9983	0.9947	0.9831	0.9307	0.7947	0.5871	0.4286	0.4851	0.7576	0.9643	0.9953	0.9987	(86)
MIT	19.8870	20.0754	20.3433	20.6866	20.9096	20.9876	20.9984	20.9968	20.9490	20.6347	20.1978	19.8572	(87)
Th 2	19.9421	19.9442	19.9462	19.9557	19.9575	19.9658	19.9658	19.9673	19.9626	19.9575	19.9539	19.9501	(88)
util rest of house													
	0.9975	0.9925	0.9761	0.9038	0.7316	0.4976	0.3287	0.3781	0.6677	0.9445	0.9930	0.9982	(89)
MIT 2	18.9401	19.1289	19.3939	19.7236	19.9059	19.9614	19.9655	19.9666	19.9402	19.6858	19.2592	18.9168	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.2789	19.4675	19.7335	20.0681	20.2650	20.3285	20.3350	20.3352	20.3011	20.0253	19.5950	19.2532	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2789	19.4675	19.7335	20.0681	20.2650	20.3285	20.3350	20.3352	20.3011	20.0253	19.5950	19.2532	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9912	0.9743	0.9072	0.7515	0.5296	0.3646	0.4166	0.6989	0.9461	0.9920	0.9977	(94)
Useful gains	490.1099	581.3328	650.8765	698.7533	627.6663	442.1051	291.0161	305.6263	462.8506	531.7824	488.6867	465.5834	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1198.7484	1163.2882	1054.4993	880.9515	674.3291	447.0041	291.4463	306.5558	485.5507	742.0577	987.5357	1194.5102	(97)
Space heating kWh													
	527.2270	391.0741	300.2953	131.1827	34.7171	0.0000	0.0000	0.0000	0.0000	156.4448	359.1713	542.3215	(98a)
Space heating requirement - total per year (kWh/year)												2442.4338	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	527.2270	391.0741	300.2953	131.1827	34.7171	0.0000	0.0000	0.0000	0.0000	156.4448	359.1713	542.3215	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2442.4338	
Space heating per m2											(98c) / (4) =	35.7813	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	733.4948	577.4321	592.0540	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9399	0.9739	0.9576	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	689.4333	562.3330	566.9572	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	939.1157	898.3923	824.7208	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	179.7714	250.0282	191.7762	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	44.9428	62.5070	47.9440	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												155.3939	(107)
Energy for space heating												35.7813	(99)
Energy for space cooling												2.2765	(108)
Total												38.0578	(109)
Fabric Energy Efficiency (TFEE)												38.1	(109)

Full SAP Calculation Printout

Plot Reference	P-34	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-34
Plot Address	Flat 3, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	76 C	**DER**	6.73	**TER**	13.88
Environmental	95 A	**% DER < TER**			51.51
CO_2 Emissions (t/year)	0.39	**DFEE**	38.47	**TFEE**	38.06
Compliance Check	See BREL	**% DFEE < TFEE**			-1.09
% DPER < TPER	6.07	**DPER**	69.14	**TPER**	73.60

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.1100	(17)
Infiltration rate			0.1555	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1322	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1685	0.1652	0.1619	0.1454	0.1421	0.1256	0.1256	0.1223	0.1322	0.1421	0.1487	0.1553	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			15.2400	1.1450	17.4504			(27)
Ground Floor			68.2600	0.1200	8.1912	110.0000	7508.6000	(28a)
Brickwork	62.8700	20.8300	42.0400	0.2100	8.8284	110.0000	4624.3999	(29a)
Communal Wall	6.9700	2.0600	4.9100	0.2100	1.0311	110.0000	540.1000	(29a)
Total net area of external elements Aum(A, m2)			138.1000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.3738			(33)
Main dwelling								
Party Wall 1			43.5700	0.0000	0.0000	110.0000	4792.7000	(32)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			181.8100			9.0000	1636.2900	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21149.8898	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							309.8431	(35)
List of Thermal Bridges								

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	22.1700	0.1120	2.4830
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425
E16 Corner (normal)	6.3000	0.0540	0.3402
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055
E18 Party wall between dwellings	9.4500	0.0380	0.3591
P1 Party wall - Ground floor	13.8400	0.1080	1.4947
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0160	0.5280

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.2235 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.5973 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	(39)
Average = Sum(39)m / 12 =												79.3177	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	(40)
HLP (average)												1.1620	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)
Hot water usage for mixer showers

61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)											Total = Sum(45)m =	1905.0938	
Distribution loss (46)m = 0.15 x (45)m													
	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
									Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
12Total per year (kWh/year)												2222	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4484	107.8893	97.4484	100.6967	97.4484	100.6967	97.4484	97.4484	100.6967	97.4484	100.6967	97.4484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains	435.0134	445.1807	425.2984	408.1709	385.4533	369.7820	354.2259	355.3466	367.3114	381.6530	407.7002	425.2587	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.5900	10.6334	0.3300	0.0000	0.7700	15.1039	(74)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	114.9155	211.2338	325.2023	455.4844	552.2729	565.2276	538.0020	464.2386	370.6200	243.6934	140.5835	96.3755	(83)
Total gains	549.9289	656.4145	750.5007	863.6554	937.7261	935.0096	892.2279	819.5851	737.9315	625.3464	548.2837	521.6342	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	
alpha	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	
util living area	0.9968	0.9906	0.9709	0.8969	0.7369	0.5362	0.3902	0.4431	0.7045	0.9453	0.9920	0.9977	(86)
MIT	19.9766	20.1738	20.4445	20.7560	20.9385	20.9917	20.9989	20.9978	20.9639	20.6919	20.2637	19.9295	(87)
Th 2	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	(88)
util rest of house	0.9956	0.9869	0.9598	0.8621	0.6707	0.4516	0.2977	0.3432	0.6134	0.9179	0.9882	0.9967	(89)
MIT 2	18.7769	19.0271	19.3644	19.7274	19.9075	19.9469	19.9503	19.9500	19.9312	19.6670	19.1430	18.7169	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.2061	19.4373	19.7508	20.0953	20.2763	20.3207	20.3254	20.3248	20.3006	20.0336	19.5439	19.1507	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2061	19.4373	19.7508	20.0953	20.2763	20.3207	20.3254	20.3248	20.3006	20.0336	19.5439	19.1507	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9943	0.9845	0.9572	0.8675	0.6922	0.4819	0.3309	0.3791	0.6452	0.9205	0.9862	0.9957	(94)
Useful gains	546.7900	646.2447	718.3434	749.2027	649.1282	450.5408	295.2140	310.6926	476.1374	575.6393	540.7289	519.3993	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1182.3174	1153.0672	1051.0225	887.9892	680.2532	453.7528	295.4934	311.3091	491.8206	748.2530	987.0214	1185.8564	(97)
Space heating kWh	472.8324	340.5847	247.5132	99.9262	23.1570	0.0000	0.0000	0.0000	0.0000	128.4246	321.3306	495.8441	(98a)
Space heating requirement - total per year (kWh/year)												2129.6128	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	472.8324	340.5847	247.5132	99.9262	23.1570	0.0000	0.0000	0.0000	0.0000	128.4246	321.3306	495.8441	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2129.6128	
Space heating per m2											(98c) / (4) =	31.1985	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	472.8324	340.5847	247.5132	99.9262	23.1570	0.0000	0.0000	0.0000	0.0000	128.4246	321.3306	495.8441	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	472.8324	340.5847	247.5132	99.9262	23.1570	0.0000	0.0000	0.0000	0.0000	128.4246	321.3306	495.8441	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2129.6128	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												684.8345	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3018.6893	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2129.6128	0.1566	333.5902	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			430.2675	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			459.4978	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.7300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2129.6128	1.5799	3364.5688	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			4406.8902	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			4719.2343	(286)
Dwelling Primary energy Rate (DPER)			69.1400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1149	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3649	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3102	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3644	(22b)
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			15.0200	1.1450	17.1985			(27)
Ground Floor			68.2600	0.1300	8.8738			(28a)
Brickwork	62.8700	15.0200	47.8500	0.1800	8.6130			(29a)
Communal Wall	6.9700	2.0600	4.9100	0.1800	0.8838			(29a)
Total net area of external elements Aum(A, m2)			138.1000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6291			(33)
Main dwelling								
Party Wall 1			43.5700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 309.8431 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	22.1700	0.1600	3.5472
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0700	1.5519
E16 Corner (normal)	6.3000	0.0900	0.5670
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0900	-0.2835
E18 Party wall between dwellings	9.4500	0.0600	0.5670
P1 Party wall - Ground floor	13.8400	0.0800	1.1072
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0500	1.6500

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1883 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.8174 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.2120	33.0376	32.8666	32.0636	31.9134	31.2140	31.2140	31.0845	31.4834	31.9134	32.2173	32.5350	(38)
Heat transfer coeff	80.0293	79.8549	79.6840	78.8810	78.7307	78.0314	78.0314	77.9018	78.3008	78.7307	79.0347	79.3524	(39)
Average = Sum(39)m / 12 =												78.8803	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1724	1.1699	1.1674	1.1556	1.1534	1.1431	1.1431	1.1413	1.1471	1.1534	1.1578	1.1625	(40)
HLP (average)												1.1556	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)
Average daily hot water use (litres/day)												114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	244.2086	215.9707	229.2891	201.0606	194.5772	174.9630	172.3298	179.3233	181.4738	202.8156	216.2432	241.4563	(62)
WWHRS	-27.9594	-24.7276	-25.8933	-21.4407	-19.9819	-17.0987	-16.0273	-17.0434	-17.6909	-20.8557	-23.6270	-27.4417	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
										Total per year (kWh/year) = Sum(64)m =		2193.9237	(64)
12Total per year (kWh/year)												2194	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.9825	91.4853	98.0217	87.9331	86.4800	79.2556	79.0828	81.4081	81.4205	89.2193	92.9813	102.0673	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4814	107.9259	97.4814	100.7308	97.4814	100.7308	97.4814	97.4814	100.7308	97.4814	100.7308	97.4814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)													

	138.4173	136.1389	131.7496	122.1293	116.2366	110.0773	106.2940	109.4195	113.0840	119.9184	129.1407	137.1873	(72)
Total internal gains	488.1484	498.3193	478.4335	461.3071	438.5883	419.9181	404.3609	405.4816	417.4475	434.7880	460.8363	478.3938	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.0300	10.6334	0.6300	0.7000	0.7700	13.0963	(74)
Southeast	3.9300	36.7938	0.6300	0.7000	0.7700	44.1916	(77)
West	7.0600	19.6403	0.6300	0.7000	0.7700	42.3764	(80)

Solar gains	99.6642	183.1995	282.0420	395.0318	478.9723	490.2066	466.5950	402.6234	321.4316	211.3512	121.9256	83.5848	(83)
Total gains	587.8127	681.5188	760.4755	856.3389	917.5606	910.1247	870.9559	808.1050	738.8791	646.1392	582.7620	561.9785	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.4102	73.5705	73.7284	74.4789	74.6210	75.2898	75.2898	75.4150	75.0308	74.6210	74.3341	74.0364	
alpha	5.8940	5.9047	5.9152	5.9653	5.9747	6.0193	6.0193	6.0277	6.0021	5.9747	5.9556	5.9358	
util living area	0.9956	0.9888	0.9695	0.8985	0.7452	0.5419	0.3933	0.4416	0.6974	0.9366	0.9891	0.9966	(86)
MIT	20.0113	20.1946	20.4493	20.7559	20.9361	20.9918	20.9990	20.9980	20.9670	20.7181	20.3113	19.9811	(87)
Th 2	19.9421	19.9442	19.9462	19.9557	19.9575	19.9658	19.9658	19.9673	19.9626	19.9575	19.9539	19.9501	(88)
util rest of house	0.9938	0.9845	0.9579	0.8641	0.6796	0.4577	0.3014	0.3435	0.6073	0.9063	0.9841	0.9952	(89)
MIT 2	18.8147	19.0481	19.3665	19.7320	19.9124	19.9622	19.9655	19.9668	19.9450	19.7016	19.2051	18.7823	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.2428	19.4583	19.7539	20.0983	20.2786	20.3305	20.3352	20.3357	20.3106	20.0652	19.6008	19.2111	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2428	19.4583	19.7539	20.0983	20.2786	20.3305	20.3352	20.3357	20.3106	20.0652	19.6008	19.2111	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9819	0.9553	0.8694	0.7008	0.4878	0.3343	0.3787	0.6389	0.9100	0.9819	0.9939	(94)
Useful gains	583.2334	669.1663	726.4529	744.4779	643.0069	443.9830	291.1993	306.0464	472.0345	588.0178	572.1886	558.5244	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1195.8589	1162.5487	1056.1220	883.3326	675.4023	447.1606	291.4661	306.5996	486.2965	745.2039	988.0003	1191.1695	(97)
Space heating kWh	455.7934	331.5530	245.2738	99.9754	24.1022	0.0000	0.0000	0.0000	0.0000	116.9464	299.3844	470.6879	(98a)
Space heating requirement - total per year (kWh/year)												2043.7167	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	455.7934	331.5530	245.2738	99.9754	24.1022	0.0000	0.0000	0.0000	0.0000	116.9464	299.3844	470.6879	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2043.7167	
Space heating per m2										(98c) / (4) =		29.9402	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.7934	331.5530	245.2738	99.9754	24.1022	0.0000	0.0000	0.0000	0.0000	116.9464	299.3844	470.6879	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	493.8174	359.2123	265.7355	108.3158	26.1129	0.0000	0.0000	0.0000	0.0000	126.7025	324.3602	509.9544	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6902	85.2816	84.4807	82.8007	80.7933	79.8000	79.8000	79.8000	79.8000	83.0950	85.0450	85.7762	(217)
Fuel for water heating, kWh/month	252.3616	224.2491	240.7601	216.9303	216.1013	197.8249	195.8678	203.3583	205.2416	218.9782	226.4875	249.5034	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.2547	16.2491	14.6305	10.7189	8.2796	6.7645	7.5529	9.8176	12.7521	16.7314	18.8981	20.8177	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3097	-27.1386	-40.9912	-48.5120	-54.4467	-51.6084	-50.9824	-47.0686	-40.5400	-32.0902	-20.5958	-15.6793	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.6768	-14.3472	-29.0843	-44.5269	-59.7069	-60.2925	-59.5798	-50.0617	-36.1942	-20.7887	-9.0010	-5.2575 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2214.2110	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2647.6641	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	163.4671	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-843.4804	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4267.8618	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2214.2110	0.2100	464.9843	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2647.6641	0.2100	556.0095	(264)
Space and water heating			1020.9938	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.4671	0.1443	23.5934	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9630	0.1335	-59.8221	
PV Unit electricity exported	-395.5175	0.1253	-49.5744	
Total			-109.3964	(269)
Total CO2, kg/year			947.1200	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2214.2110	1.1300	2502.0584	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2647.6641	1.1300	2991.8604	(278)
Space and water heating			5493.9188	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.4671	1.5338	250.7313	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9630	1.4935	-669.0286	
PV Unit electricity exported	-395.5175	0.4601	-181.9615	
Total			-850.9901	(283)
Total Primary energy kWh/year			5023.7608	(286)
Target Primary Energy Rate (TPER)			73.6000	(287)

Full SAP Calculation Printout

Plot Reference	P-34	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-34
Plot Address	Flat 3, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	76 C	**DER**	6.73	**TER**	13.88
Environmental	95 A	**% DER < TER**			51.51
CO_2 Emissions (t/year)	0.39	**DFEE**	38.47	**TFEE**	38.06
Compliance Check	See BREL	**% DFEE < TFEE**			-1.09
% DPER < TPER	6.07	**DPER**	69.14	**TPER**	73.60

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.1100	(17)
Infiltration rate			0.1555	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1322	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1685	0.1652	0.1619	0.1454	0.1421	0.1256	0.1256	0.1223	0.1322	0.1421	0.1487	0.1553	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			15.2400	1.1450	17.4504			(27)
Ground Floor			68.2600	0.1200	8.1912	110.0000	7508.6000	(28a)
Brickwork	62.8700	20.8300	42.0400	0.2100	8.8284	110.0000	4624.3999	(29a)
Communal Wall	6.9700	2.0600	4.9100	0.2100	1.0311	110.0000	540.1000	(29a)
Total net area of external elements Aum(A, m2)			138.1000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.3738			(33)
Main dwelling								
Party Wall 1			43.5700	0.0000	0.0000	110.0000	4792.7000	(32)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			181.8100			9.0000	1636.2900	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21149.8898	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							309.8431	(35)
List of Thermal Bridges								

	Length	Psi-value	Total	
K1 Element				
E5 Ground floor (normal)	22.1700	0.1120	2.4830	
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425	
E16 Corner (normal)	6.3000	0.0540	0.3402	
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055	
E18 Party wall between dwellings	9.4500	0.0380	0.3591	
P1 Party wall - Ground floor	13.8400	0.1080	1.4947	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815	
E4 Jamb	33.0000	0.0160	0.5280	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.2235	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	50.5973	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	(39)
Average = Sum(39)m / 12 =												79.3177	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	(40)
HLP (average)												1.1620	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2032	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day)	114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)											Total = Sum(45)m =	1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
											Total per year (kWh/year) = Sum(64)m =	2222.4248	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.5900	10.6334	0.3300	0.0000	0.7700	15.1039	(74)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	114.9155	211.2338	325.2023	455.4844	552.2729	565.2276	538.0020	464.2386	370.6200	243.6934	140.5835	96.3755	(83)

Total gains	608.7375	703.2360	801.5163	902.1490	969.6523	955.9598	912.8575	841.7609	763.1058	663.0427	592.5475	576.8739	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	
alpha	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	
util living area													
	0.9946	0.9868	0.9613	0.8810	0.7185	0.5251	0.3815	0.4317	0.6859	0.9313	0.9883	0.9961	(86)
MIT	20.0521	20.2314	20.4997	20.7825	20.9460	20.9926	20.9991	20.9981	20.9685	20.7266	20.3186	20.0010	(87)
Th 2	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	(88)
util rest of house													
	0.9925	0.9818	0.9472	0.8432	0.6522	0.4419	0.2910	0.3342	0.5953	0.8992	0.9829	0.9945	(89)
MIT 2	18.8728	19.0992	19.4302	19.7547	19.9132	19.9473	19.9503	19.9500	19.9340	19.7045	19.2116	18.8078	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.2947	19.5042	19.8128	20.1224	20.2827	20.3213	20.3255	20.3250	20.3041	20.0701	19.6077	19.2347	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2947	19.5042	19.8128	20.1224	20.2827	20.3213	20.3255	20.3250	20.3041	20.0701	19.6077	19.2347	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9791	0.9450	0.8501	0.6741	0.4717	0.3234	0.3692	0.6271	0.9035	0.9806	0.9930	(94)
Useful gains	603.1143	688.5063	757.4299	766.8852	653.6011	450.9235	295.2516	310.7863	478.5329	599.0327	581.0390	572.8555	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1189.3463	1158.3755	1055.9391	890.1353	680.7624	453.7966	295.4983	311.3209	492.0928	751.1484	992.0783	1192.5158	(97)
Space heating kWh													
	436.1566	315.7521	222.0909	88.7401	20.2080	0.0000	0.0000	0.0000	0.0000	113.1741	295.9483	461.0272	(98a)
Space heating requirement - total per year (kWh/year)												1953.0972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	436.1566	315.7521	222.0909	88.7401	20.2080	0.0000	0.0000	0.0000	0.0000	113.1741	295.9483	461.0272	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1953.0972	
Space heating per m2											(98c) / (4) =	28.6126	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	436.1566	315.7521	222.0909	88.7401	20.2080	0.0000	0.0000	0.0000	0.0000	113.1741	295.9483	461.0272	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	436.1566	315.7521	222.0909	88.7401	20.2080	0.0000	0.0000	0.0000	0.0000	113.1741	295.9483	461.0272	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1953.0972	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												684.8345	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2842.1737	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1953.0972	16.4900	322.0657	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	16.4900	112.9292	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	16.4900	7.2837	(249)
Energy for lighting	160.0718	16.4900	26.3958	(250)
Additional standing charges			0.0000	(251)
Total energy cost			468.6744	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.4897	(257)
SAP value		75.8521	
SAP rating (Section 12)		76	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1953.0972	0.1568	306.1784	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			402.8557	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			432.0860	(272)
CO2 emissions per m2			6.3300	(273)
EI value			94.8879	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 68.2600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1100	(17)
Infiltration rate		0.1555	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1322 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1421	0.1355	0.1355	0.1256	0.1289	0.1123	0.1123	0.1090	0.1123	0.1256	0.1223	0.1322	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			15.2400	1.1450	17.4504			(27)
Ground Floor			68.2600	0.1200	8.1912	110.0000	7508.6000	(28a)
Brickwork	62.8700	20.8300	42.0400	0.2100	8.8284	110.0000	4624.3999	(29a)
Communal Wall	6.9700	2.0600	4.9100	0.2100	1.0311	110.0000	540.1000	(29a)
Total net area of external elements Aum(A, m2)			138.1000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.3738			(33)
Main dwelling								
Party Wall 1			43.5700	0.0000	0.0000	110.0000	4792.7000	(32)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			181.8100			9.0000	1636.2900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21149.8898 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 309.8431 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	22.1700	0.1120	2.4830
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425
E16 Corner (normal)	6.3000	0.0540	0.3402
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055
E18 Party wall between dwellings	9.4500	0.0380	0.3591
P1 Party wall - Ground floor	13.8400	0.1080	1.4947
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0160	0.5280

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.2235 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.5973 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	(39)

Average = Sum(39)m / 12 = 79.3177

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	(40)
HLP (average)												1.1620	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)
Hot water usage for mixer showers

61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
									Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)

Water heating gains (Table 5)

	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)

Total internal gains

	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.5900	12.7650	0.3300	0.0000	0.7700	18.1317	(74)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
West	9.7900	23.8018	0.3300	0.0000	0.7700	59.2102	(80)

Solar gains	136.9723	220.4589	337.9663	481.9717	570.2445	617.6284	581.9780	514.3404	411.1053	273.2858	165.1651	115.4759	(83)
Total gains	630.7943	712.4612	814.2804	928.6363	987.6240	1008.3606	956.8335	891.8627	803.5911	692.6350	617.1291	595.9743	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	
alpha	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	
util living area	0.9918	0.9821	0.9462	0.8321	0.6319	0.4078	0.2735	0.3022	0.5812	0.8893	0.9804	0.9938	(86)
MIT	20.1623	20.3227	20.5937	20.8580	20.9757	20.9984	20.9999	20.9998	20.9883	20.8187	20.4384	20.1184	(87)
Th 2	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	(88)
util rest of house	0.9885	0.9751	0.9266	0.7833	0.5577	0.3262	0.1866	0.2090	0.4851	0.8415	0.9712	0.9913	(89)
MIT 2	19.0128	19.2138	19.5429	19.8325	19.9362	19.9500	19.9505	19.9505	19.9457	19.8026	19.3611	18.9575	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.4240	19.6105	19.9188	20.1994	20.3081	20.3251	20.3259	20.3259	20.3187	20.1661	19.7465	19.3728	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4240	19.6105	19.9188	20.1994	20.3081	20.3251	20.3259	20.3259	20.3187	20.1661	19.7465	19.3728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9863	0.9723	0.9259	0.7958	0.5836	0.3554	0.2177	0.2424	0.5195	0.8526	0.9690	0.9894	(94)
Useful gains	622.1244	692.7101	753.9282	738.9809	576.3879	358.4183	208.2634	216.1748	417.4473	590.5285	597.9784	589.6489	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1136.1502	1103.3486	992.9657	816.9214	587.5951	358.9199	208.2825	216.2111	421.8639	687.3758	931.7028	1132.0834	(97)
Space heating kWh	382.4352	275.9491	177.8439	56.1172	8.3381	0.0000	0.0000	0.0000	0.0000	72.0544	240.2815	403.5713	(98a)
Space heating requirement - total per year (kWh/year)												1616.5907	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	382.4352	275.9491	177.8439	56.1172	8.3381	0.0000	0.0000	0.0000	0.0000	72.0544	240.2815	403.5713	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1616.5907	
Space heating per m2											(98c) / (4) =	23.6828	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	382.4352	275.9491	177.8439	56.1172	8.3381	0.0000	0.0000	0.0000	0.0000	72.0544	240.2815	403.5713	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	382.4352	275.9491	177.8439	56.1172	8.3381	0.0000	0.0000	0.0000	0.0000	72.0544	240.2815	403.5713	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2											0.0000	(213)
Water heating												
Water heating requirement												
224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater											324.5200	(216)
(217)m 324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month												
69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement												
(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting 19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1616.5907	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	684.8345	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2505.6671	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1616.5907	27.6700	447.3106	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	27.6700	189.4937	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	27.6700	12.2219	(249)
Energy for lighting	160.0718	27.6700	44.2919	(250)
Additional standing charges			0.0000	(251)
Total energy cost			693.3181	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1616.5907	0.1575	254.6883	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			351.3657	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			380.5959	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1616.5907	1.5832	2559.4221	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			3601.7435	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			3914.0876	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 76
Current environmental impact rating: A 95

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 76
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£693	£693	£0
Space heating	£460	£460	£0
Water heating	£189	£189	£0
Lighting	£44	£44	£0
Total cost of fuels	£693	£693	£0
Total cost of uses	£693	£693	£0
Delivered energy	37 kWh/m²	37 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.1100 (17)
Infiltration rate		0.1555 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1322 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1685	0.1652	0.1619	0.1454	0.1421	0.1256	0.1256	0.1223	0.1322	0.1421	0.1487	0.1553	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation — 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) — 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			15.2400	1.1450	17.4504			(27)
Ground Floor			68.2600	0.1200	8.1912	110.0000	7508.6000	(28a)
Brickwork	62.8700	20.8300	42.0400	0.2100	8.8284	110.0000	4624.3999	(29a)
Communal Wall	6.9700	2.0600	4.9100	0.2100	1.0311	110.0000	540.1000	(29a)
Total net area of external elements Aum(A, m2)			138.1000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.3738			(33)
Main dwelling								
Party Wall 1			43.5700	0.0000	0.0000	110.0000	4792.7000	(32)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			181.8100			9.0000	1636.2900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21149.8898 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 309.8431 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	22.1700	0.1120	2.4830
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425
E16 Corner (normal)	6.3000	0.0540	0.3402
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055
E18 Party wall between dwellings	9.4500	0.0380	0.3591
P1 Party wall - Ground floor	13.8400	0.1080	1.4947
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0160	0.5280

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.2235 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.5973 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	(39)
Average = Sum(39)m / 12 =												79.3177	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	(40)
HLP (average)												1.1620	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)
Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
										Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)

Water heating gains (Table 5)

	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852 (72)
Total internal gains												
	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.5900	10.6334	0.3300	0.0000	0.7700	15.1039	(74)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	114.9155	211.2338	325.2023	455.4844	552.2729	565.2276	538.0020	464.2386	370.6200	243.6934	140.5835	96.3755	(83)
Total gains	608.7375	703.2360	801.5163	902.1490	969.6523	955.9598	912.8575	841.7609	763.1058	663.0427	592.5475	576.8739	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	
alpha	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	
util living area													
	0.9946	0.9868	0.9613	0.8810	0.7185	0.5251	0.3815	0.4317	0.6859	0.9313	0.9883	0.9961	(86)
MIT	20.0521	20.2314	20.4997	20.7825	20.9460	20.9926	20.9991	20.9981	20.9685	20.7266	20.3186	20.0010	(87)
Th 2	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	(88)
util rest of house													
	0.9925	0.9818	0.9472	0.8432	0.6522	0.4419	0.2910	0.3342	0.5953	0.8992	0.9829	0.9945	(89)
MIT 2	18.8728	19.0992	19.4302	19.7547	19.9132	19.9473	19.9503	19.9500	19.9340	19.7045	19.2116	18.8078	(90)
Living area fraction											fLA = Living area / (4) =	0.3577	(91)
MIT	19.2947	19.5042	19.8128	20.1224	20.2827	20.3213	20.3255	20.3250	20.3041	20.0701	19.6077	19.2347	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2947	19.5042	19.8128	20.1224	20.2827	20.3213	20.3255	20.3250	20.3041	20.0701	19.6077	19.2347	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9908	0.9791	0.9450	0.8501	0.6741	0.4717	0.3234	0.3692	0.6271	0.9035	0.9806	0.9930	(94)
Useful gains	603.1143	688.5063	757.4299	766.8852	653.6011	450.9235	295.2516	310.7863	478.5329	599.0327	581.0390	572.8555	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1189.3463	1158.3755	1055.9391	890.1353	680.7624	453.7966	295.4983	311.3209	492.0928	751.1484	992.0783	1192.5158	(97)
Space heating kWh													
	436.1566	315.7521	222.0909	88.7401	20.2080	0.0000	0.0000	0.0000	0.0000	113.1741	295.9483	461.0272	(98a)
Space heating requirement - total per year (kWh/year)												1953.0972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	436.1566	315.7521	222.0909	88.7401	20.2080	0.0000	0.0000	0.0000	0.0000	113.1741	295.9483	461.0272	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1953.0972	
Space heating per m2											(98c) / (4) =	28.6126	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	436.1566	315.7521	222.0909	88.7401	20.2080	0.0000	0.0000	0.0000	0.0000	113.1741	295.9483	461.0272	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	436.1566	315.7521	222.0909	88.7401	20.2080	0.0000	0.0000	0.0000	0.0000	113.1741	295.9483	461.0272	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1953.0972	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	684.8345	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2842.1737	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1953.0972	16.4900	322.0657	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	16.4900	112.9292	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	16.4900	7.2837	(249)
Energy for lighting	160.0718	16.4900	26.3958	(250)
Additional standing charges			0.0000	(251)
Total energy cost			468.6744	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.4897	(257)
SAP value		75.8521	
SAP rating (Section 12)		76	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1953.0972	0.1568	306.1784	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			402.8557	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			432.0860	(272)
CO2 emissions per m2			6.3300	(273)
EI value			94.8879	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1100	(17)
Infiltration rate		0.1555	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1322	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate													
	0.1421	0.1355	0.1355	0.1256	0.1289	0.1123	0.1123	0.1090	0.1123	0.1256	0.1223	0.1322	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			15.2400	1.1450	17.4504			(27)
Ground Floor			68.2600	0.1200	8.1912	110.0000	7508.6000	(28a)
Brickwork	62.8700	20.8300	42.0400	0.2100	8.8284	110.0000	4624.3999	(29a)
Communal Wall	6.9700	2.0600	4.9100	0.2100	1.0311	110.0000	540.1000	(29a)
Total net area of external elements Aum(A, m2)			138.1000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.3738			(33)
Main dwelling								
Party Wall 1			43.5700	0.0000	0.0000	110.0000	4792.7000	(32)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			181.8100			9.0000	1636.2900	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21149.8898	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							309.8431	(35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	22.1700	0.1120	2.4830
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425
E16 Corner (normal)	6.3000	0.0540	0.3402
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055
E18 Party wall between dwellings	9.4500	0.0380	0.3591
P1 Party wall - Ground floor	13.8400	0.1080	1.4947
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0160	0.5280

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.2235	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.5973	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	79.3177	(39)
Average = Sum(39)m / 12 =												79.3177	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	1.1620	(40)
HLP (average)												1.1620	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2032	(42)
Hot water usage for mixer showers	61.1592 60.2401 58.9008 56.3383 54.4472 52.3383 51.1395 52.4687 53.9258 56.1901 58.8077	60.9249	(42a)
Hot water usage for baths	26.4237 26.0313 25.4786 24.4597 23.6967 22.8507 22.3938 22.9425 23.5400 24.4453 25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925 35.8400 34.4876 33.1351 31.7827 30.4302 30.4302 31.7827 33.1351 34.4876 35.8400	37.1925	(42c)
Average daily hot water use (litres/day)		114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)
Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
224.5651 198.2282 209.6456 182.0507 174.9337 155.9531 152.6863 159.6798 162.4639 183.1721 197.2333 221.8128 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
Output from w/h
224.5651 198.2282 209.6456 182.0507 174.9337 155.9531 152.6863 159.6798 162.4639 183.1721 197.2333 221.8128 (64)
Total per year (kWh/year) = Sum(64)m = 2222.4248 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
65.7066 57.8168 60.7458 51.8596 49.2041 43.1821 41.8068 44.1322 45.3470 51.9434 56.9078 64.7914 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
22.6598 20.1262 16.3678 12.3914 9.2628 7.8200 8.4498 10.9834 14.7418 18.7182 21.8469 23.2896 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
288.3618 291.3541 283.8136 267.7608 247.4971 228.4520 215.7287 212.7364 220.2769 236.3297 256.5934 275.6385 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
50.4221 50.4221 50.4221 50.4221 50.4221 50.4221 50.4221 50.4221 50.4221 50.4221 50.4221 50.4221 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-88.1260 -88.1260 -88.1260 -88.1260 -88.1260 -88.1260 -88.1260 -88.1260 -88.1260 -88.1260 -88.1260 -88.1260 (71)
Water heating gains (Table 5)
88.3153 86.0369 81.6476 72.0272 66.1346 59.9752 56.1920 59.3175 62.9819 69.8164 79.0386 87.0852 (72)
Total internal gains
493.8220 492.0023 476.3141 446.6646 417.3795 390.7323 374.8555 377.5223 392.4857 419.3493 451.9640 480.4984 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.5900	12.7650	0.3300	0.0000	0.7700	18.1317	(74)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
West	9.7900	23.8018	0.3300	0.0000	0.7700	59.2102	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	136.9723	220.4589	337.9663	481.9717	570.2445	617.6284	581.9780	514.3404	411.1053	273.2858	165.1651	115.4759	(83)
Total gains	630.7943	712.4612	814.2804	928.6363	987.6240	1008.3606	956.8335	891.8627	803.5911	692.6350	617.1291	595.9743	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	74.0688	
alpha	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	5.9379	
util living area	0.9918	0.9821	0.9462	0.8321	0.6319	0.4078	0.2735	0.3022	0.5812	0.8893	0.9804	0.9938	(86)
MIT	20.1623	20.3227	20.5937	20.8580	20.9757	20.9984	20.9999	20.9998	20.9883	20.8187	20.4384	20.1184	(87)
Th 2	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	19.9505	(88)
util rest of house	0.9885	0.9751	0.9266	0.7833	0.5577	0.3262	0.1866	0.2090	0.4851	0.8415	0.9712	0.9913	(89)
MIT 2	19.0128	19.2138	19.5429	19.8325	19.9362	19.9500	19.9505	19.9505	19.9457	19.8026	19.3611	18.9575	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.4240	19.6105	19.9188	20.1994	20.3081	20.3251	20.3259	20.3259	20.3187	20.1661	19.7465	19.3728	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4240	19.6105	19.9188	20.1994	20.3081	20.3251	20.3259	20.3259	20.3187	20.1661	19.7465	19.3728	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9863	0.9723	0.9259	0.7958	0.5836	0.3554	0.2177	0.2424	0.5195	0.8526	0.9690	0.9894	(94)
Useful gains	622.1244	692.7101	753.9282	738.9809	576.3879	358.4183	208.2634	216.1748	417.4473	590.5285	597.9784	589.6489	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1136.1502	1103.3486	992.9657	816.9214	587.5951	358.9199	208.2825	216.2111	421.8639	687.3758	931.7028	1132.0834	(97)
Space heating kWh	382.4352	275.9491	177.8439	56.1172	8.3381	0.0000	0.0000	0.0000	0.0000	72.0544	240.2815	403.5713	(98a)
Space heating requirement - total per year (kWh/year)												1616.5907	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	382.4352	275.9491	177.8439	56.1172	8.3381	0.0000	0.0000	0.0000	0.0000	72.0544	240.2815	403.5713	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1616.5907	
Space heating per m2											(98c) / (4) =	23.6828	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	382.4352	275.9491	177.8439	56.1172	8.3381	0.0000	0.0000	0.0000	0.0000	72.0544	240.2815	403.5713	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	382.4352	275.9491	177.8439	56.1172	8.3381	0.0000	0.0000	0.0000	0.0000	72.0544	240.2815	403.5713	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1616.5907	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												684.8345	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)													
mechanical ventilation fans (SFP = 0.2080)												44.1702	(230a)
Total electricity for the above, kWh/year												44.1702	(231)
Electricity for lighting (calculated in Appendix L)												160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2505.6671	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1616.5907	27.6700	447.3106	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	27.6700	189.4937	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	27.6700	12.2219	(249)
Energy for lighting	160.0718	27.6700	44.2919	(250)
Additional standing charges			0.0000	(251)
Total energy cost			693.3181	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1616.5907	0.1575	254.6883	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			351.3657	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			380.5959	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1616.5907	1.5832	2559.4221	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			3601.7435	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			3914.0876	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-35	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-35
Plot Address	Flat 4, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	8.05	**TER**	17.12
Environmental	95 A	**% DER < TER**			52.98
CO_2 Emissions (t/year)	0.35	**DFEE**	45.67	**TFEE**	46.83
Compliance Check	See BREL	**% DFEE < TFEE**			2.48
% DPER < TPER	9.33	**DPER**	82.76	**TPER**	91.27

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	335.66	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	25.82 m	52.47 m²	2.55 m

8.0 Living Area 23.74 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	44.65	31.77	0.00	None	12.88	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	30.04	27.98	0.70	Stairwell Access Corridor 3	2.06	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	9.54	9.54	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	14.54	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	116.13

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	52.47

11.0 Heat Loss Floors

Summary for Input Data

elmhurst energy

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	52.47

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Patio Door	Brickwork	North West	5.59	
West	Window	Brickwork	West	7.29	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	25.82	0.11	0.11	RCD	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	25.82	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	9.45	0.05	0.05	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	3.15	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	5.10	0.11	0.11		No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	5.10	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	6.23	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.94	0.02	0.02	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	6.30	-0.10	-0.10	RCD	No

Y-value	0.04	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes	
Approved Installation	Yes	
Mechanical Ventilation data Type	Database	
Type	Mechanical extract ventilation - centralised	
MV Reference Number	500107	
Configuration	2	
Manufacturer SFP	0.16	
Duct Type	Rigid	
Wet Rooms	2	

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	

21.0 Fixed Cooling System	No	

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa

Summary for Input Data

Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.06	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	

25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	

26.0 Heat Networks	None

27.0 Secondary Heating	None

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

Summary for Input Data

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-35	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-35
Plot Address	Flat 4, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	8.05	**TER**	17.12
Environmental	95 A	**% DER < TER**			52.98
CO_2 Emissions (t/year)	0.35	**DFEE**	45.67	**TFEE**	46.83
Compliance Check	See BREL	**% DFEE < TFEE**			2.48
% DPER < TPER	9.33	**DPER**	82.76	**TPER**	91.27

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0600 (17)
Infiltration rate		0.1530 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1300 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1658	0.1626	0.1593	0.1431	0.1398	0.1235	0.1235	0.1203	0.1300	0.1398	0.1463	0.1528	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			7.2900	1.1450	8.3473			(27)
Ground Floor			52.4700	0.1200	6.2964	110.0000	5771.7000	(28a)
Brickwork	44.6500	12.8800	31.7700	0.2100	6.6717	110.0000	3494.7002	(29a)
Communal Wall	30.0400	2.0600	27.9800	0.2100	5.8758	110.0000	3077.8001	(29a)
Lift Shaft Wall	9.5400		9.5400	0.1600	1.5264	110.0000	1049.4000	(29a)
Total net area of external elements Aum(A, m2)			136.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.5904			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17612.2702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		335.6636 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	25.8200	0.1120	2.8918
E7 Party floor between dwellings (in blocks of flats)	25.8200	0.0380	0.9812
E16 Corner (normal)	9.4500	0.0540	0.5103
E18 Party wall between dwellings	3.1500	0.0380	0.1197
P1 Party wall - Ground floor	5.1000	0.1080	0.5508
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.9400	0.0160	0.3030
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0572 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.6476 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	(39)

Average = Sum(39)m / 12 = 64.7244

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	(40)
HLP (average)												1.2336	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)

Energy content (annual) Total = Sum(45)m = 1675.1071

Distribution loss (46)m = 0.15 x (45)m

26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)

Total per year (kWh/year) = Sum(64)m = 1992.4381 (64)

12Total per year (kWh/year) 1992 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	358.2381	366.1326	349.9525	335.5235	316.9621	303.9820	291.2929	292.4466	302.2694	314.2488	335.7378	350.3773	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.5900	11.2829	0.3300	0.0000	0.7700	16.0265	(81)
West	7.2900	19.6403	0.3300	0.0000	0.7700	36.3814	(80)

Solar gains	52.4079	103.7922	175.9817	267.4644	339.2413	352.7788	333.5689	278.5372	207.9345	124.3161	65.5288	43.0064	(83)
Total gains	410.6461	469.9247	525.9342	602.9879	656.2034	656.7608	624.8619	570.9837	510.2039	438.5649	401.2667	393.3837	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	
alpha	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	
util living area	0.9982	0.9955	0.9865	0.9436	0.8184	0.6157	0.4536	0.5165	0.7951	0.9724	0.9958	0.9986	(86)
MIT	19.9341	20.0878	20.3333	20.6598	20.8969	20.9844	20.9979	20.9955	20.9349	20.6082	20.2056	19.8967	(87)
Th 2	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	(88)
util rest of house	0.9974	0.9935	0.9802	0.9184	0.7530	0.5167	0.3408	0.3951	0.7007	0.9549	0.9935	0.9980	(89)
MIT 2	18.6709	18.8668	19.1770	19.5717	19.8195	19.8866	19.8928	19.8922	19.8576	19.5208	19.0180	18.6231	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.2424	19.4192	19.7002	20.0640	20.3070	20.3833	20.3928	20.3914	20.3451	20.0128	19.5553	19.1993	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2424	19.4192	19.7002	20.0640	20.3070	20.3833	20.3928	20.3914	20.3451	20.0128	19.5553	19.1993	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9923	0.9788	0.9229	0.7792	0.5616	0.3920	0.4504	0.7422	0.9573	0.9925	0.9975	(94)
Useful gains	409.3039	466.3223	514.7730	556.5211	511.3348	368.8171	244.9570	257.1603	378.6754	419.8351	398.2621	392.3822	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	967.1387	939.7485	854.3743	722.5833	557.0802	374.3202	245.4861	258.3412	404.2077	609.2377	806.1623	970.8220	(97)
Space heating kWh	415.0291	318.1424	252.6634	119.5648	34.0346	0.0000	0.0000	0.0000	0.0000	140.9156	293.6881	430.3593	(98a)
Space heating requirement - total per year (kWh/year)												2004.3972	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	415.0291	318.1424	252.6634	119.5648	34.0346	0.0000	0.0000	0.0000	0.0000	140.9156	293.6881	430.3593	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2004.3972	
Space heating per m2											(98c) / (4) =	38.2008	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	415.0291	318.1424	252.6634	119.5648	34.0346	0.0000	0.0000	0.0000	0.0000	140.9156	293.6881	430.3593	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	415.0291	318.1424	252.6634	119.5648	34.0346	0.0000	0.0000	0.0000	0.0000	140.9156	293.6881	430.3593	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2004.3972	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2779.6120	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2004.3972	0.1559	312.4603	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			399.1041	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			422.1867	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.0500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2004.3972	1.5771	3161.1966	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			4095.5451	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			4342.1617	(286)
Dwelling Primary energy Rate (DPER)			82.7600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1495	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3995	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)
Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0600	1.1450	12.6641			(27)
Ground Floor			52.4700	0.1300	6.8211			(28a)
Brickwork	44.6500	11.0600	33.5900	0.1800	6.0462			(29a)
Communal Wall	30.0400	2.0600	27.9800	0.1800	5.0364			(29a)
Lift Shaft Wall	9.5400		9.5400	0.1800	1.7172			(29a)
Total net area of external elements Aum(A, m2)			136.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.3450			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 335.6636 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	25.8200	0.1600	4.1312
E7 Party floor between dwellings (in blocks of flats)	25.8200	0.0700	1.8074
E16 Corner (normal)	9.4500	0.0900	0.8505
E18 Party wall between dwellings	3.1500	0.0600	0.1890
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.9400	0.0500	0.9470
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0776 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.4226 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	68.6373	68.4766	68.3191	67.5793	67.4409	66.7966	66.7966	66.6773	67.0448	67.4409	67.7209	68.0136	(39)
Average = Sum(39)m / 12 =												67.5787	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3081	1.3051	1.3021	1.2880	1.2853	1.2730	1.2730	1.2708	1.2778	1.2853	1.2907	1.2962	(40)
HLP (average)												1.2879	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	220.3518	194.9791	207.2344	182.2321	176.7131	159.2853	157.1511	163.3000	165.0091	183.9559	195.5810	217.9316	(62)
WWHRS	-24.5851	-21.7433	-22.7683	-18.8531	-17.5704	-15.0351	-14.0930	-14.9865	-15.5559	-18.3387	-20.7755	-24.1298	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
										Total per year (kWh/year) = Sum(64)m =		1995.2899	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

95.0501	84.5056	90.6886	81.6726	80.5402	74.0428	74.0358	76.0804	75.9460	82.9484	86.1111	94.2454	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.6886	86.0124	77.6886	80.2783	77.6886	80.2783	77.6886	77.6886	80.2783	77.6886	80.2783	77.6886	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)

Water heating gains (Table 5)

	127.7555	125.7524	121.8932	113.4342	108.2530	102.8372	99.5106	102.2586	105.4805	111.4898	119.5988	126.6739 (72)

Total internal gains

	411.5328	419.4478	403.2471	388.8245	370.2568	354.2830	341.5875	342.7412	352.5705	367.5434	389.0389	403.6720 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2600	19.6403	0.6300	0.7000	0.7700	37.5745	(80)
Northwest	4.8000	11.2829	0.6300	0.7000	0.7700	16.5514	(81)

Solar gains	54.1259	107.1946	181.7505	276.2318	350.3612	364.3423	344.5029	287.6674	214.7506	128.3913	67.6770	44.4162	(83)
Total gains	465.6587	526.6425	584.9976	665.0563	720.6180	718.6254	686.0904	630.4086	567.3211	495.9347	456.7159	448.0881	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.2776	71.4448	71.6095	72.3934	72.5420	73.2417	73.2417	73.3728	72.9706	72.5420	72.2420	71.9311	
alpha	5.7518	5.7630	5.7740	5.8262	5.8361	5.8828	5.8828	5.8915	5.8647	5.8361	5.8161	5.7954	
util living area	0.9967	0.9926	0.9799	0.9259	0.7885	0.5832	0.4267	0.4829	0.7551	0.9573	0.9923	0.9973	(86)
MIT	19.9277	20.0883	20.3433	20.6817	20.9070	20.9867	20.9982	20.9964	20.9459	20.6426	20.2308	19.9045	(87)
Th 2	19.8345	19.8369	19.8392	19.8503	19.8523	19.8620	19.8620	19.8638	19.8583	19.8523	19.8482	19.8438	(88)
util rest of house	0.9952	0.9893	0.9709	0.8950	0.7187	0.4854	0.3173	0.3657	0.6560	0.9322	0.9882	0.9961	(89)
MIT 2	18.6185	18.8242	19.1460	19.5574	19.7878	19.8566	19.8617	19.8630	19.8301	19.5252	19.0151	18.5959	(90)
Living area fraction									fLA = Living area / (4) =			0.4524	(91)
MIT	19.2109	19.3961	19.6877	20.0661	20.2942	20.3679	20.3759	20.3758	20.3350	20.0307	19.5652	19.1880	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2109	19.3961	19.6877	20.0661	20.2942	20.3679	20.3759	20.3758	20.3350	20.0307	19.5652	19.1880	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9941	0.9877	0.9694	0.9016	0.7473	0.5297	0.3670	0.4190	0.7000	0.9369	0.9869	0.9952	(94)
Useful gains	462.9076	520.1457	567.0880	599.6233	538.5030	380.6473	251.7727	264.1607	397.1040	464.6510	450.7390	445.9368	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1023.4411	992.6467	900.9739	754.5946	579.5994	385.2765	252.2158	265.0962	418.0234	636.0180	844.1524	1019.3865	(97)
Space heating kWh	417.0369	317.5206	248.4111	111.5793	30.5757	0.0000	0.0000	0.0000	0.0000	127.4970	283.2577	426.6466	(98a)
Space heating requirement - total per year (kWh/year)												1962.5250	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	417.0369	317.5206	248.4111	111.5793	30.5757	0.0000	0.0000	0.0000	0.0000	127.4970	283.2577	426.6466	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1962.5250	
Space heating per m2										(98c) / (4) =		37.4028	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.0369	317.5206	248.4111	111.5793	30.5757	0.0000	0.0000	0.0000	0.0000	127.4970	283.2577	426.6466	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	451.8276	344.0094	269.1345	120.8877	33.1264	0.0000	0.0000	0.0000	0.0000	138.1333	306.8880	462.2390	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7119	85.4001	84.7279	83.2229	81.1251	79.8000	79.8000	79.8000	79.8000	83.4802	85.1358	85.7782	(217)
Fuel for water heating, kWh/month	228.4009	202.8521	217.7159	196.3151	196.1695	180.7647	179.2708	185.8566	187.2847	198.3909	205.3255	225.9336	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1422	12.9498	11.6599	8.5425	6.5985	5.3910	6.0194	7.8242	10.1629	13.3342	15.0610	16.5908	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1917	-21.0987	-31.9692	-37.9679	-42.7442	-40.5813	-40.1064	-36.9728	-31.7515	-25.0210	-15.9913	-12.1470	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-5.0149	-10.7905	-21.8964	-33.5491	-45.0033	-45.4346	-44.8805	-37.6891	-27.2324	-15.6259	-6.7591	-3.9466 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2126.2459 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2404.2804 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	130.2765 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-648.3653 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4098.4375 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2126.2459	0.2100	446.5116	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2404.2804	0.2100	504.8989	(264)
Space and water heating			951.4105	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.2765	0.1443	18.8029	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5430	0.1335	-46.7857	
PV Unit electricity exported	-297.8224	0.1253	-37.3253	
Total			-84.1110	(269)
Total CO2, kg/year			898.0317	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.1200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2126.2459	1.1300	2402.6579	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2404.2804	1.1300	2716.8368	(278)
Space and water heating			5119.4947	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.2765	1.5338	199.8225	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5430	1.4932	-523.4325	
PV Unit electricity exported	-297.8224	0.4600	-137.0017	
Total			-660.4341	(283)
Total Primary energy kWh/year			4788.9838	(286)
Target Primary Energy Rate (TPER)			91.2700	(287)

Full SAP Calculation Printout

Plot Reference	P-35	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-35
Plot Address	Flat 4, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	8.05	**TER**	17.12
Environmental	95 A	**% DER < TER**			52.98
CO_2 Emissions (t/year)	0.35	**DFEE**	45.67	**TFEE**	46.83
Compliance Check	See BREL	**% DFEE < TFEE**			2.48
% DPER < TPER	9.33	**DPER**	82.76	**TPER**	91.27

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	133.7985	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0600	(17)
Infiltration rate		0.3025	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2571	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3278	0.3214	0.3150	0.2828	0.2764	0.2443	0.2443	0.2378	0.2571	0.2764	0.2892	0.3021	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5537	0.5516	0.5496	0.5400	0.5382	0.5298	0.5298	0.5283	0.5331	0.5382	0.5418	0.5456	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			7.2900	1.1450	8.3473			(27)
Ground Floor			52.4700	0.1200	6.2964	110.0000	5771.7000	(28a)
Brickwork	44.6500	12.8800	31.7700	0.2100	6.6717	110.0000	3494.7002	(29a)
Communal Wall	30.0400	2.0600	27.9800	0.2100	5.8758	110.0000	3077.8001	(29a)
Lift Shaft Wall	9.5400		9.5400	0.1600	1.5264	110.0000	1049.4000	(29a)
Total net area of external elements Aum(A, m2)			136.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5904			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17612.2702	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	335.6636	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	25.8200	0.1120	2.8918	
E7 Party floor between dwellings (in blocks of flats)	25.8200	0.0380	0.9812	
E16 Corner (normal)	9.4500	0.0540	0.5103	
E18 Party wall between dwellings	3.1500	0.0380	0.1197	
P1 Party wall - Ground floor	5.1000	0.1080	0.5508	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115	
E4 Jamb	18.9400	0.0160	0.3030	
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.0572 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	42.6476 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.4491	24.3570	24.2667	23.8426	23.7632	23.3938	23.3938	23.3254	23.5361	23.7632	23.9238	24.0916	(38)
Heat transfer coeff	67.0968	67.0046	66.9143	66.4902	66.4109	66.0415	66.0415	65.9730	66.1837	66.4109	66.5714	66.7392	(39)
Average = Sum(39)m / 12 =												66.4898	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2788	1.2770	1.2753	1.2672	1.2657	1.2587	1.2587	1.2573	1.2614	1.2657	1.2688	1.2719	(40)
HLP (average)												1.2672	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7629	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)
Hot water usage for other uses	32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)
Average daily hot water use (litres/day)												51.2690	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.9338	54.4000	52.7252	50.6402	48.7804	46.8475	46.4454	48.1167	49.8310	51.8160	53.9195	55.8552	(44)
Energy conte	88.5855	77.4649	81.0367	69.3239	65.6677	57.6044	56.1717	59.5786	61.4466	70.3138	76.8182	87.4557	(45)
Energy content (annual)										Total = Sum(45)m =		851.4677	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(64)
										Total per year (kWh/year) = Sum(64)m =		723.7475	(64)
12Total per year (kWh/year)												724	(64)
Electric shower(s)	43.0673	38.3733	41.9022	39.9868	40.7371	38.8592	40.1546	40.7371	39.9868	41.9022	41.1143	43.0673	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		489.8882	(64a)
Heat gains from water heating, kWh/month	29.5912	26.0546	27.6959	24.7280	24.1387	21.9557	21.9751	22.8447	23.0541	25.4172	26.6024	29.3512	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	39.7732	38.7718	37.2256	34.3445	32.4444	30.4941	29.5364	30.7053	32.0196	34.1630	36.9478	39.4505	(72)
Total internal gains	320.3579	329.2540	315.3870	306.5358	291.2556	281.7409	271.4208	270.9953	278.9105	287.0240	303.1890	313.2560	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.5900	11.2829	0.3300	0.0000	0.7700	16.0265	(81)
West	7.2900	19.6403	0.3300	0.0000	0.7700	36.3814	(80)

Solar gains	52.4079	103.7922	175.9817	267.4644	339.2413	352.7788	333.5689	278.5372	207.9345	124.3161	65.5288	43.0064	(83)
Total gains	372.7658	433.0461	491.3686	574.0002	630.4969	634.5197	604.9898	549.5325	486.8450	411.3400	368.7178	356.2624	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.9141	73.0143	73.1128	73.5792	73.6671	74.0792	74.0792	74.1560	73.9199	73.6671	73.4895	73.3047	
alpha	5.8609	5.8676	5.8742	5.9053	5.9111	5.9386	5.9386	5.9437	5.9280	5.9111	5.8993	5.8870	
util living area	0.9989	0.9972	0.9908	0.9568	0.8463	0.6449	0.4771	0.5449	0.8269	0.9806	0.9974	0.9992	(86)
MIT	19.8191	19.9786	20.2366	20.5963	20.8672	20.9787	20.9969	20.9936	20.9144	20.5456	20.1186	19.7910	(87)
Th 2	19.8575	19.8589	19.8602	19.8666	19.8678	19.8734	19.8734	19.8744	19.8712	19.8678	19.8654	19.8629	(88)
util rest of house	0.9985	0.9959	0.9864	0.9359	0.7839	0.5417	0.3568	0.4158	0.7353	0.9674	0.9959	0.9988	(89)
MIT 2	18.7973	18.9573	19.2139	19.5631	19.7916	19.8662	19.8729	19.8732	19.8333	19.5238	19.1025	18.7735	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.2596	19.4194	19.6766	20.0306	20.2783	20.3696	20.3814	20.3801	20.3224	19.9861	19.5623	19.2339	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2596	19.4194	19.6766	20.0306	20.2783	20.3696	20.3814	20.3801	20.3224	19.9861	19.5623	19.2339	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9952	0.9855	0.9395	0.8086	0.5885	0.4115	0.4747	0.7755	0.9691	0.9953	0.9985	(94)
Useful gains	372.0594	430.9576	484.2261	539.2725	509.8148	373.4451	248.9645	260.8700	377.5361	398.6346	366.9984	355.7443	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1003.7427	972.8648	881.7042	740.0755	569.6895	381.0301	249.7321	262.5813	411.8230	623.3390	829.6307	1003.3483	(97)
Space heating kWh	469.9724	364.1616	295.7237	144.5782	44.5468	0.0000	0.0000	0.0000	0.0000	167.1801	333.0953	481.8174	(98a)
Space heating requirement - total per year (kWh/year)												2301.0753	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	469.9724	364.1616	295.7237	144.5782	44.5468	0.0000	0.0000	0.0000	0.0000	167.1801	333.0953	481.8174	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2301.0753	
Space heating per m2											(98c) / (4) =	43.8551	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	620.7897	488.7068	501.3952	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9084	0.9562	0.9287	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	563.9112	467.3202	465.6556	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	713.8897	680.9068	617.5700	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	107.9845	158.9084	113.0243	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.9961	39.7271	28.2561	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												94.9793	(107)
Energy for space heating												43.8551	(99)
Energy for space cooling												1.8102	(108)
Total												45.6652	(109)
Fabric Energy Efficiency (DFEE)												45.7	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495 (8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3995	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0600	1.1450	12.6641			(27)
Ground Floor			52.4700	0.1300	6.8211			(28a)
Brickwork	44.6500	11.0600	33.5900	0.1800	6.0462			(29a)
Communal Wall	30.0400	2.0600	27.9800	0.1800	5.0364			(29a)
Lift Shaft Wall	9.5400		9.5400	0.1800	1.7172			(29a)
Total net area of external elements Aum(A, m2)			136.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3450			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	335.6636 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	25.8200	0.1600	4.1312
E7 Party floor between dwellings (in blocks of flats)	25.8200	0.0700	1.8074
E16 Corner (normal)	9.4500	0.0900	0.8505
E18 Party wall between dwellings	3.1500	0.0600	0.1890
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.9400	0.0500	0.9470
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.0776	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	42.4226	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	68.6373	68.4766	68.3191	67.5793	67.4409	66.7966	66.7966	66.6773	67.0448	67.4409	67.7209	68.0136	(39)
Average = Sum(39)m / 12 =												67.5787	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3081	1.3051	1.3021	1.2880	1.2853	1.2730	1.2730	1.2708	1.2778	1.2853	1.2907	1.2962	(40)
HLP (average)												1.2879	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7629 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)	51.2690 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.9338	54.4000	52.7252	50.6402	48.7804	46.8475	46.4454	48.1167	49.8310	51.8160	53.9195	55.8552	(44)
Energy conte	88.5855	77.4649	81.0367	69.3239	65.6677	57.6044	56.1717	59.5786	61.4466	70.3138	76.8182	87.4557	(45)
Energy content (annual)										Total = Sum(45)m =		851.4677	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(64)
									Total per year (kWh/year) = Sum(64)m =		723.7475	(64)
12Total per year (kWh/year)											724	(64)

Electric shower(s)

43.0673	38.3733	41.9022	39.9868	40.7371	38.8592	40.1546	40.7371	39.9868	41.9022	41.1143	43.0673	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	489.8882 (64a)

Heat gains from water heating, kWh/month

29.5912	26.0546	27.6959	24.7280	24.1387	21.9557	21.9751	22.8447	23.0541	25.4172	26.6024	29.3512	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.6886	86.0124	77.6886	80.2783	77.6886	80.2783	77.6886	77.6886	80.2783	77.6886	80.2783	77.6886	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	39.7732	38.7718	37.2256	34.3445	32.4444	30.4941	29.5364	30.7053	32.0196	34.1630	36.9478	39.4505	(72)
Total internal gains													
	320.5505	329.4672	315.5795	306.7348	291.4482	281.9399	271.6134	271.1879	279.1095	287.2165	303.3880	313.4486	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2600	19.6403	0.6300	0.7000	0.7700	37.5745	(80)
Northwest	4.8000	11.2829	0.6300	0.7000	0.7700	16.5514	(81)

Solar gains	54.1259	107.1946	181.7505	276.2318	350.3612	364.3423	344.5029	287.6674	214.7506	128.3913	67.6770	44.4162	(83)
Total gains	374.6764	436.6618	497.3300	582.9666	641.8094	646.2822	616.1163	558.8553	493.8602	415.6079	371.0649	357.8648	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.2776	71.4448	71.6095	72.3934	72.5420	73.2417	73.2417	73.3728	72.9706	72.5420	72.2420	71.9311	
alpha	5.7518	5.7630	5.7740	5.8262	5.8361	5.8828	5.8828	5.8915	5.8647	5.8361	5.8161	5.7954	
util living area													
	0.9989	0.9971	0.9906	0.9556	0.8437	0.6406	0.4738	0.5415	0.8250	0.9802	0.9973	0.9992	(86)
MIT	19.7865	19.9509	20.2166	20.5892	20.8649	20.9787	20.9969	20.9935	20.9129	20.5364	20.0998	19.7639	(87)
Th 2	19.8345	19.8369	19.8392	19.8503	19.8523	19.8620	19.8620	19.8638	19.8583	19.8523	19.8482	19.8438	(88)
util rest of house													
	0.9984	0.9957	0.9860	0.9342	0.7804	0.5369	0.3531	0.4119	0.7324	0.9668	0.9958	0.9988	(89)
MIT 2	18.7464	18.9121	19.1769	19.5423	19.7752	19.8549	19.8615	19.8626	19.8198	19.5020	19.0700	18.7313	(90)
Living area fraction									fLA = Living area / (4) =			0.4524	(91)
MIT	19.2170	19.3821	19.6473	20.0159	20.2682	20.3633	20.3752	20.3743	20.3144	19.9700	19.5359	19.1985	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2170	19.3821	19.6473	20.0159	20.2682	20.3633	20.3752	20.3743	20.3144	19.9700	19.5359	19.1985	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9980	0.9950	0.9850	0.9379	0.8054	0.5839	0.4080	0.4711	0.7730	0.9685	0.9952	0.9985	(94)
Useful gains	373.9434	434.4899	489.8844	546.7482	516.9106	377.3667	251.3915	263.2679	381.7467	402.5297	369.2926	357.3278	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1023.8636	991.6879	898.2128	751.2072	577.8471	384.9705	252.1707	264.9954	416.6410	631.9203	842.1736	1020.1008	(97)
Space heating kWh													
	483.5406	374.4370	303.7963	147.2105	45.3368	0.0000	0.0000	0.0000	0.0000	170.6666	340.4743	493.1031	(98a)
Space heating requirement - total per year (kWh/year)												2358.5653	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	483.5406	374.4370	303.7963	147.2105	45.3368	0.0000	0.0000	0.0000	0.0000	170.6666	340.4743	493.1031	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2358.5653	
Space heating per m2											(98c) / (4) =	44.9507	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	627.8882	494.2950	506.7475	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9096	0.9566	0.9294	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	571.1157	472.8656	470.9943	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	727.4224	693.7049	628.2654	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	112.5408	164.3045	117.0097	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	28.1352	41.0761	29.2524	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												98.4637	(107)
Energy for space heating												44.9507	(99)
Energy for space cooling												1.8766	(108)
Total												46.8273	(109)
Fabric Energy Efficiency (TFEE)												46.8	(109)

Full SAP Calculation Printout

Plot Reference	P-35	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-35
Plot Address	Flat 4, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	8.05	**TER**	17.12
Environmental	95 A	**% DER < TER**			52.98
CO_2 Emissions (t/year)	0.35	**DFEE**	45.67	**TFEE**	46.83
Compliance Check	See BREL	**% DFEE < TFEE**			2.48
% DPER < TPER	9.33	**DPER**	82.76	**TPER**	91.27

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0600 (17)
Infiltration rate		0.1530 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1300 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1658	0.1626	0.1593	0.1431	0.1398	0.1235	0.1235	0.1203	0.1300	0.1398	0.1463	0.1528	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			7.2900	1.1450	8.3473			(27)
Ground Floor			52.4700	0.1200	6.2964	110.0000	5771.7000	(28a)
Brickwork	44.6500	12.8800	31.7700	0.2100	6.6717	110.0000	3494.7002	(29a)
Communal Wall	30.0400	2.0600	27.9800	0.2100	5.8758	110.0000	3077.8001	(29a)
Lift Shaft Wall	9.5400		9.5400	0.1600	1.5264	110.0000	1049.4000	(29a)
Total net area of external elements Aum(A, m2)			136.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.5904			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17612.2702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		335.6636 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	25.8200	0.1120	2.8918
E7 Party floor between dwellings (in blocks of flats)	25.8200	0.0380	0.9812
E16 Corner (normal)	9.4500	0.0540	0.5103
E18 Party wall between dwellings	3.1500	0.0380	0.1197
P1 Party wall - Ground floor	5.1000	0.1080	0.5508
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.9400	0.0160	0.3030
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0572 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.6476 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	(39)

Average = Sum(39)m / 12 = 64.7244

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	(40)
HLP (average)												1.2336	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)

Energy content (annual) Total = Sum(45)m = 1675.1071

Distribution loss (46)m = 0.15 x (45)m

26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)

Total per year (kWh/year) = Sum(64)m = 1992.4381 (64)

12Total per year (kWh/year) 1992 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	358.2381	366.1326	349.9525	335.5235	316.9621	303.9820	291.2929	292.4466	302.2694	314.2488	335.7378	350.3773	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.5900	11.2829	0.3300	0.0000	0.7700	16.0265	(81)
West	7.2900	19.6403	0.3300	0.0000	0.7700	36.3814	(80)

Solar gains	52.4079	103.7922	175.9817	267.4644	339.2413	352.7788	333.5689	278.5372	207.9345	124.3161	65.5288	43.0064	(83)
Total gains	410.6461	469.9247	525.9342	602.9879	656.2034	656.7608	624.8619	570.9837	510.2039	438.5649	401.2667	393.3837	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	
alpha	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	
util living area	0.9982	0.9955	0.9865	0.9436	0.8184	0.6157	0.4536	0.5165	0.7951	0.9724	0.9958	0.9986	(86)
MIT	19.9341	20.0878	20.3333	20.6598	20.8969	20.9844	20.9979	20.9955	20.9349	20.6082	20.2056	19.8967	(87)
Th 2	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	(88)
util rest of house	0.9974	0.9935	0.9802	0.9184	0.7530	0.5167	0.3408	0.3951	0.7007	0.9549	0.9935	0.9980	(89)
MIT 2	18.6709	18.8668	19.1770	19.5717	19.8195	19.8866	19.8928	19.8922	19.8576	19.5208	19.0180	18.6231	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.2424	19.4192	19.7002	20.0640	20.3070	20.3833	20.3928	20.3914	20.3451	20.0128	19.5553	19.1993	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2424	19.4192	19.7002	20.0640	20.3070	20.3833	20.3928	20.3914	20.3451	20.0128	19.5553	19.1993	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9923	0.9788	0.9229	0.7792	0.5616	0.3920	0.4504	0.7422	0.9573	0.9925	0.9975	(94)
Useful gains	409.3039	466.3223	514.7730	556.5211	511.3348	368.8171	244.9570	257.1603	378.6754	419.8351	398.2621	392.3822	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	967.1387	939.7485	854.3743	722.5833	557.0802	374.3202	245.4861	258.3412	404.2077	609.2377	806.1623	970.8220	(97)
Space heating kWh	415.0291	318.1424	252.6634	119.5648	34.0346	0.0000	0.0000	0.0000	0.0000	140.9156	293.6881	430.3593	(98a)
Space heating requirement - total per year (kWh/year)												2004.3972	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	415.0291	318.1424	252.6634	119.5648	34.0346	0.0000	0.0000	0.0000	0.0000	140.9156	293.6881	430.3593	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2004.3972	
Space heating per m2											(98c) / (4) =	38.2008	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	415.0291	318.1424	252.6634	119.5648	34.0346	0.0000	0.0000	0.0000	0.0000	140.9156	293.6881	430.3593	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	415.0291	318.1424	252.6634	119.5648	34.0346	0.0000	0.0000	0.0000	0.0000	140.9156	293.6881	430.3593	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2004.3972	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2779.6120	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2004.3972	0.1559	312.4603	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			399.1041	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			422.1867	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.0500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2004.3972	1.5771	3161.1966	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			4095.5451	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			4342.1617	(286)
Dwelling Primary energy Rate (DPER)			82.7600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1495	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3995	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)
Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0600	1.1450	12.6641			(27)
Ground Floor			52.4700	0.1300	6.8211			(28a)
Brickwork	44.6500	11.0600	33.5900	0.1800	6.0462			(29a)
Communal Wall	30.0400	2.0600	27.9800	0.1800	5.0364			(29a)
Lift Shaft Wall	9.5400		9.5400	0.1800	1.7172			(29a)
Total net area of external elements Aum(A, m2)			136.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.3450			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 335.6636 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	25.8200	0.1600	4.1312
E7 Party floor between dwellings (in blocks of flats)	25.8200	0.0700	1.8074
E16 Corner (normal)	9.4500	0.0900	0.8505
E18 Party wall between dwellings	3.1500	0.0600	0.1890
P1 Party wall - Ground floor	5.1000	0.0800	0.4080
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.9400	0.0500	0.9470
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0776 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.4226 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	68.6373	68.4766	68.3191	67.5793	67.4409	66.7966	66.7966	66.6773	67.0448	67.4409	67.7209	68.0136	(39)
Average = Sum(39)m / 12 =												67.5787	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3081	1.3051	1.3021	1.2880	1.2853	1.2730	1.2730	1.2708	1.2778	1.2853	1.2907	1.2962	(40)
HLP (average)												1.2879	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	220.3518	194.9791	207.2344	182.2321	176.7131	159.2853	157.1511	163.3000	165.0091	183.9559	195.5810	217.9316	(62)
WWHRS	-24.5851	-21.7433	-22.7683	-18.8531	-17.5704	-15.0351	-14.0930	-14.9865	-15.5559	-18.3387	-20.7755	-24.1298	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
										Total per year (kWh/year) = Sum(64)m =		1995.2899	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

95.0501	84.5056	90.6886	81.6726	80.5402	74.0428	74.0358	76.0804	75.9460	82.9484	86.1111	94.2454	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.6886	86.0124	77.6886	80.2783	77.6886	80.2783	77.6886	77.6886	80.2783	77.6886	80.2783	77.6886	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)

Water heating gains (Table 5)

	127.7555	125.7524	121.8932	113.4342	108.2530	102.8372	99.5106	102.2586	105.4805	111.4898	119.5988	126.6739 (72)

Total internal gains

	411.5328	419.4478	403.2471	388.8245	370.2568	354.2830	341.5875	342.7412	352.5705	367.5434	389.0389	403.6720 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2600	19.6403	0.6300	0.7000	0.7700	37.5745	(80)
Northwest	4.8000	11.2829	0.6300	0.7000	0.7700	16.5514	(81)

Solar gains	54.1259	107.1946	181.7505	276.2318	350.3612	364.3423	344.5029	287.6674	214.7506	128.3913	67.6770	44.4162	(83)
Total gains	465.6587	526.6425	584.9976	665.0563	720.6180	718.6254	686.0904	630.4086	567.3211	495.9347	456.7159	448.0881	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.2776	71.4448	71.6095	72.3934	72.5420	73.2417	73.2417	73.3728	72.9706	72.5420	72.2420	71.9311	
alpha	5.7518	5.7630	5.7740	5.8262	5.8361	5.8828	5.8828	5.8915	5.8647	5.8361	5.8161	5.7954	
util living area	0.9967	0.9926	0.9799	0.9259	0.7885	0.5832	0.4267	0.4829	0.7551	0.9573	0.9923	0.9973	(86)
MIT	19.9277	20.0883	20.3433	20.6817	20.9070	20.9867	20.9982	20.9964	20.9459	20.6426	20.2308	19.9045	(87)
Th 2	19.8345	19.8369	19.8392	19.8503	19.8523	19.8620	19.8620	19.8638	19.8583	19.8523	19.8482	19.8438	(88)
util rest of house	0.9952	0.9893	0.9709	0.8950	0.7187	0.4854	0.3173	0.3657	0.6560	0.9322	0.9882	0.9961	(89)
MIT 2	18.6185	18.8242	19.1460	19.5574	19.7878	19.8566	19.8617	19.8630	19.8301	19.5252	19.0151	18.5959	(90)
Living area fraction									fLA = Living area / (4) =			0.4524	(91)
MIT	19.2109	19.3961	19.6877	20.0661	20.2942	20.3679	20.3759	20.3758	20.3350	20.0307	19.5652	19.1880	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2109	19.3961	19.6877	20.0661	20.2942	20.3679	20.3759	20.3758	20.3350	20.0307	19.5652	19.1880	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9941	0.9877	0.9694	0.9016	0.7473	0.5297	0.3670	0.4190	0.7000	0.9369	0.9869	0.9952	(94)
Useful gains	462.9076	520.1457	567.0880	599.6233	538.5030	380.6473	251.7727	264.1607	397.1040	464.6510	450.7390	445.9368	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1023.4411	992.6467	900.9739	754.5946	579.5994	385.2765	252.2158	265.0962	418.0234	636.0180	844.1524	1019.3865	(97)
Space heating kWh	417.0369	317.5206	248.4111	111.5793	30.5757	0.0000	0.0000	0.0000	0.0000	127.4970	283.2577	426.6466	(98a)
Space heating requirement - total per year (kWh/year)												1962.5250	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	417.0369	317.5206	248.4111	111.5793	30.5757	0.0000	0.0000	0.0000	0.0000	127.4970	283.2577	426.6466	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1962.5250	
Space heating per m2										(98c) / (4) =		37.4028	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.0369	317.5206	248.4111	111.5793	30.5757	0.0000	0.0000	0.0000	0.0000	127.4970	283.2577	426.6466	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	451.8276	344.0094	269.1345	120.8877	33.1264	0.0000	0.0000	0.0000	0.0000	138.1333	306.8880	462.2390	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7119	85.4001	84.7279	83.2229	81.1251	79.8000	79.8000	79.8000	79.8000	83.4802	85.1358	85.7782	(217)
Fuel for water heating, kWh/month	228.4009	202.8521	217.7159	196.3151	196.1695	180.7647	179.2708	185.8566	187.2847	198.3909	205.3255	225.9336	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1422	12.9498	11.6599	8.5425	6.5985	5.3910	6.0194	7.8242	10.1629	13.3342	15.0610	16.5908	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1917	-21.0987	-31.9692	-37.9679	-42.7442	-40.5813	-40.1064	-36.9728	-31.7515	-25.0210	-15.9913	-12.1470	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-5.0149	-10.7905	-21.8964	-33.5491	-45.0033	-45.4346	-44.8805	-37.6891	-27.2324	-15.6259	-6.7591	-3.9466 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2126.2459 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2404.2804 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	130.2765 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-648.3653 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4098.4375 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2126.2459	0.2100	446.5116	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2404.2804	0.2100	504.8989	(264)
Space and water heating			951.4105	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.2765	0.1443	18.8029	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5430	0.1335	-46.7857	
PV Unit electricity exported	-297.8224	0.1253	-37.3253	
Total			-84.1110	(269)
Total CO2, kg/year			898.0317	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.1200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2126.2459	1.1300	2402.6579	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2404.2804	1.1300	2716.8368	(278)
Space and water heating			5119.4947	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.2765	1.5338	199.8225	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5430	1.4932	-523.4325	
PV Unit electricity exported	-297.8224	0.4600	-137.0017	
Total			-660.4341	(283)
Total Primary energy kWh/year			4788.9838	(286)
Target Primary Energy Rate (TPER)			91.2700	(287)

Full SAP Calculation Printout

Plot Reference	P-35	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-35
Plot Address	Flat 4, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	8.05	**TER**	17.12
Environmental	95 A	**% DER < TER**			52.98
CO_2 Emissions (t/year)	0.35	**DFEE**	45.67	**TFEE**	46.83
Compliance Check	See BREL	**% DFEE < TFEE**			2.48
% DPER < TPER	9.33	**DPER**	82.76	**TPER**	91.27

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0600 (17)
Infiltration rate		0.1530 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1300 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1658	0.1626	0.1593	0.1431	0.1398	0.1235	0.1235	0.1203	0.1300	0.1398	0.1463	0.1528	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			7.2900	1.1450	8.3473			(27)
Ground Floor			52.4700	0.1200	6.2964	110.0000	5771.7000	(28a)
Brickwork	44.6500	12.8800	31.7700	0.2100	6.6717	110.0000	3494.7002	(29a)
Communal Wall	30.0400	2.0600	27.9800	0.2100	5.8758	110.0000	3077.8001	(29a)
Lift Shaft Wall	9.5400		9.5400	0.1600	1.5264	110.0000	1049.4000	(29a)
Total net area of external elements Aum(A, m2)			136.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.5904			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17612.2702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		335.6636 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E5 Ground floor (normal)	25.8200	0.1120	2.8918	
E7 Party floor between dwellings (in blocks of flats)	25.8200	0.0380	0.9812	
E16 Corner (normal)	9.4500	0.0540	0.5103	
E18 Party wall between dwellings	3.1500	0.0380	0.1197	
P1 Party wall - Ground floor	5.1000	0.1080	0.5508	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115	
E4 Jamb	18.9400	0.0160	0.3030	
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.0572	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	42.6476	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	(39)
Average = Sum(39)m / 12 =												64.7244	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	(40)
HLP (average)												1.2336	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7629	(42)
Hot water usage for mixer showers	53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)
Hot water usage for baths	23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)
Hot water usage for other uses	32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)
Average daily hot water use (litres/day)												100.8506	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
										Total per year (kWh/year) = Sum(64)m =		1992.4381	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.5900	11.2829	0.3300	0.0000	0.7700	16.0265	(81)
West	7.2900	19.6403	0.3300	0.0000	0.7700	36.3814	(80)

Solar gains	52.4079	103.7922	175.9817	267.4644	339.2413	352.7788	333.5689	278.5372	207.9345	124.3161	65.5288	43.0064	(83)

Total gains	460.0012	509.7472	569.0919	636.1875	684.1802	676.0090	643.8551	591.2065	532.8113	471.1304	439.0550	439.9006	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	
alpha	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	
util living area													
	0.9967	0.9931	0.9802	0.9304	0.7976	0.6000	0.4405	0.4996	0.7725	0.9621	0.9932	0.9975	(86)
MIT	20.0113	20.1489	20.3953	20.6962	20.9107	20.9863	20.9982	20.9962	20.9444	20.6508	20.2636	19.9697	(87)
Th 2	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	(88)
util rest of house													
	0.9953	0.9902	0.9715	0.9012	0.7302	0.5026	0.3308	0.3817	0.6765	0.9396	0.9897	0.9964	(89)
MIT 2	18.7692	18.9440	19.2532	19.6115	19.8306	19.8875	19.8929	19.8924	19.8636	19.5695	19.0911	18.7162	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.3312	19.4891	19.7699	20.1023	20.3193	20.3847	20.3930	20.3918	20.3526	20.0587	19.6216	19.2834	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3312	19.4891	19.7699	20.1023	20.3193	20.3847	20.3930	20.3918	20.3526	20.0587	19.6216	19.2834	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9943	0.9887	0.9703	0.9075	0.7578	0.5468	0.3806	0.4354	0.7190	0.9437	0.9885	0.9955	(94)
Useful gains	457.3562	504.0054	552.1692	577.3474	518.4858	369.6235	245.0476	257.3848	383.0954	444.6152	434.0222	437.9326	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	972.8830	944.2724	858.8880	725.0613	557.8802	374.4097	245.4976	258.3687	404.6976	612.2105	810.4534	976.2612	(97)
Space heating kWh													
	383.5519	295.8594	228.1988	106.3540	29.3095	0.0000	0.0000	0.0000	0.0000	124.6909	271.0305	400.5165	(98a)
Space heating requirement - total per year (kWh/year)												1839.5115	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	383.5519	295.8594	228.1988	106.3540	29.3095	0.0000	0.0000	0.0000	0.0000	124.6909	271.0305	400.5165	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1839.5115	
Space heating per m2											(98c) / (4) =	35.0583	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	383.5519	295.8594	228.1988	106.3540	29.3095	0.0000	0.0000	0.0000	0.0000	124.6909	271.0305	400.5165	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	383.5519	295.8594	228.1988	106.3540	29.3095	0.0000	0.0000	0.0000	0.0000	124.6909	271.0305	400.5165	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1839.5115	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2614.7262	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1839.5115	16.4900	303.3354	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	16.4900	101.2428	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	16.4900	5.5988	(249)
Energy for lighting	127.2974	16.4900	20.9913	(250)
Additional standing charges			0.0000	(251)
Total energy cost			431.1684	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.5925	(257)
SAP value		74.1856	
SAP rating (Section 12)		74	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1839.5115	0.1560	287.0161	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			373.6598	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			396.7424	(272)
CO2 emissions per m2			7.5600	(273)
EI value			94.5457	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b) x	2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0600	(17)
Infiltration rate		0.1530	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1300 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1398	0.1333	0.1333	0.1235	0.1268	0.1105	0.1105	0.1073	0.1105	0.1235	0.1203	0.1300	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			7.2900	1.1450	8.3473			(27)
Ground Floor			52.4700	0.1200	6.2964	110.0000	5771.7000	(28a)
Brickwork	44.6500	12.8800	31.7700	0.2100	6.6717	110.0000	3494.7002	(29a)
Communal Wall	30.0400	2.0600	27.9800	0.2100	5.8758	110.0000	3077.8001	(29a)
Lift Shaft Wall	9.5400		9.5400	0.1600	1.5264	110.0000	1049.4000	(29a)
Total net area of external elements Aum(A, m2)			136.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.5904			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17612.2702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 335.6636 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	25.8200	0.1120	2.8918
E7 Party floor between dwellings (in blocks of flats)	25.8200	0.0380	0.9812
E16 Corner (normal)	9.4500	0.0540	0.5103
E18 Party wall between dwellings	3.1500	0.0380	0.1197
P1 Party wall - Ground floor	5.1000	0.1080	0.5508
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.9400	0.0160	0.3030
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0572 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.6476 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	(39)
Average = Sum(39)m / 12 =												64.7244	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	(40)
HLP (average)												1.2336	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)
Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
									Total per year (kWh/year) = Sum(64)m =		1992.4381	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)m

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)

Water heating gains (Table 5)

77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)

Total internal gains

407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.5900	13.7804	0.3300	0.0000	0.7700	19.5740	(81)
West	7.2900	23.8018	0.3300	0.0000	0.7700	44.0901	(80)

Solar gains	63.6641	110.3430	185.8066	286.2709	353.0375	387.9167	363.3535	311.6491	233.9395	141.9046	78.4596	52.5139	(83)
Total gains	471.2574	516.2980	578.9169	654.9939	697.9765	711.1469	673.6397	624.3184	558.8163	488.7190	451.9858	449.4082	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau 75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	
alpha 6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	
util living area 0.9951	0.9905	0.9712	0.8944	0.7128	0.4705	0.3169	0.3521	0.6694	0.9360	0.9890	0.9962	(86)
MIT 20.1102	20.2393	20.4949	20.7893	20.9575	20.9969	20.9998	20.9996	20.9774	20.7499	20.3735	20.0764	(87)
Th 2 19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	(88)
util rest of house 0.9929	0.9863	0.9583	0.8525	0.6310	0.3719	0.2107	0.2377	0.5586	0.8991	0.9830	0.9945	(89)
MIT 2 18.8953	19.0587	19.3758	19.7130	19.8684	19.8924	19.8932	19.8932	19.8840	19.6816	19.2298	18.8525	(90)
Living area fraction								fLA = Living area / (4) =			0.4524	(91)
MIT 19.4450	19.5928	19.8821	20.2000	20.3612	20.3921	20.3939	20.3938	20.3787	20.1649	19.7473	19.4063	(92)
Temperature adjustment											0.0000	
adjusted MIT 19.4450	19.5928	19.8821	20.2000	20.3612	20.3921	20.3939	20.3938	20.3787	20.1649	19.7473	19.4063	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation 0.9917	0.9848	0.9581	0.8654	0.6670	0.4167	0.2588	0.2895	0.6090	0.9097	0.9820	0.9934	(94)
Useful gains 467.3605	508.4312	554.6692	566.8290	465.5283	296.3293	174.3234	180.7541	340.3213	444.6088	443.8508	446.4512	(95)
Ext temp. 5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W 928.4708	899.2050	807.8976	666.6593	482.9184	297.2224	174.3602	180.8263	348.1328	560.8330	760.3349	925.9644	(97)
Space heating kWh 343.0661	262.5999	188.4019	71.8778	12.9382	0.0000	0.0000	0.0000	0.0000	86.4708	227.8686	356.7578	(98a)
Space heating requirement - total per year (kWh/year)											1549.9812	
Solar heating kWh 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)											0.0000	
Space heating kWh 343.0661	262.5999	188.4019	71.8778	12.9382	0.0000	0.0000	0.0000	0.0000	86.4708	227.8686	356.7578	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)											1549.9812	
Space heating per m2										(98c) / (4) =	29.5403	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement 343.0661	262.5999	188.4019	71.8778	12.9382	0.0000	0.0000	0.0000	0.0000	86.4708	227.8686	356.7578	(98)
Space heating efficiency (main heating system 1) 100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system) 343.0661	262.5999	188.4019	71.8778	12.9382	0.0000	0.0000	0.0000	0.0000	86.4708	227.8686	356.7578	(211)
Space heating efficiency (main heating system 2) 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement												
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881 (64)
Efficiency of water heater												324.5200 (216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200 (217)
Fuel for water heating, kWh/month												
	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837 (231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1549.9812 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	613.9647 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)	
mechanical ventilation fans (SFP = 0.2080)	33.9527 (230a)
Total electricity for the above, kWh/year	33.9527 (231)
Electricity for lighting (calculated in Appendix L)	127.2974 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2325.1960 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1549.9812	27.6700	428.8798	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	27.6700	169.8840	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	27.6700	9.3947	(249)
Energy for lighting	127.2974	27.6700	35.2232	(250)
Additional standing charges			0.0000	(251)
Total energy cost			643.3817	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1549.9812	0.1568	243.0673	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			329.7111	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			352.7937	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1549.9812	1.5806	2449.8509	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			3384.1994	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			3630.8160	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 74
Current environmental impact rating: A 95

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 74
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£643	£643	£0
Space heating	£438	£438	£0
Water heating	£170	£170	£0
Lighting	£35	£35	£0
Total cost of fuels	£643	£643	£0
Total cost of uses	£643	£643	£0
Delivered energy	44 kWh/m²	44 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	69 kWh/m²	69 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0600 (17)
Infiltration rate		0.1530 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1300 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1658	0.1626	0.1593	0.1431	0.1398	0.1235	0.1235	0.1203	0.1300	0.1398	0.1463	0.1528	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			7.2900	1.1450	8.3473			(27)
Ground Floor			52.4700	0.1200	6.2964	110.0000	5771.7000	(28a)
Brickwork	44.6500	12.8800	31.7700	0.2100	6.6717	110.0000	3494.7002	(29a)
Communal Wall	30.0400	2.0600	27.9800	0.2100	5.8758	110.0000	3077.8001	(29a)
Lift Shaft Wall	9.5400		9.5400	0.1600	1.5264	110.0000	1049.4000	(29a)
Total net area of external elements Aum(A, m2)			136.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.5904			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17612.2702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 335.6636 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	25.8200	0.1120	2.8918
E7 Party floor between dwellings (in blocks of flats)	25.8200	0.0380	0.9812
E16 Corner (normal)	9.4500	0.0540	0.5103
E18 Party wall between dwellings	3.1500	0.0380	0.1197
P1 Party wall - Ground floor	5.1000	0.1080	0.5508
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.9400	0.0160	0.3030
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0572 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.6476 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	(39)
Average = Sum(39)m / 12 =												64.7244	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	(40)
HLP (average)												1.2336	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)
Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)

Total per year (kWh/year) = Sum(64)m = 1992.4381 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)												
	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718 (72)
Total internal gains												
	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.5900	11.2829	0.3300	0.0000	0.7700	16.0265	(81)
West	7.2900	19.6403	0.3300	0.0000	0.7700	36.3814	(80)

Solar gains	52.4079	103.7922	175.9817	267.4644	339.2413	352.7788	333.5689	278.5372	207.9345	124.3161	65.5288	43.0064 (83)
Total gains	460.0012	509.7472	569.0919	636.1875	684.1802	676.0090	643.8551	591.2065	532.8113	471.1304	439.0550	439.9006 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866
alpha	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391
util living area												
	0.9967	0.9931	0.9802	0.9304	0.7976	0.6000	0.4405	0.4996	0.7725	0.9621	0.9932	0.9975 (86)
MIT	20.0113	20.1489	20.3953	20.6962	20.9107	20.9863	20.9982	20.9962	20.9444	20.6508	20.2636	19.9697 (87)
Th 2	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933 (88)
util rest of house												
	0.9953	0.9902	0.9715	0.9012	0.7302	0.5026	0.3308	0.3817	0.6765	0.9396	0.9897	0.9964 (89)
MIT 2	18.7692	18.9440	19.2532	19.6115	19.8306	19.8875	19.8929	19.8924	19.8636	19.5695	19.0911	18.7162 (90)
Living area fraction									fLA = Living area / (4) =			0.4524 (91)
MIT	19.3312	19.4891	19.7699	20.1023	20.3193	20.3847	20.3930	20.3918	20.3526	20.0587	19.6216	19.2834 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3312	19.4891	19.7699	20.1023	20.3193	20.3847	20.3930	20.3918	20.3526	20.0587	19.6216	19.2834 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9943	0.9887	0.9703	0.9075	0.7578	0.5468	0.3806	0.4354	0.7190	0.9437	0.9885	0.9955	(94)
Useful gains	457.3562	504.0054	552.1692	577.3474	518.4858	369.6235	245.0476	257.3848	383.0954	444.6152	434.0222	437.9326	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	972.8830	944.2724	858.8880	725.0613	557.8802	374.4097	245.4976	258.3687	404.6976	612.2105	810.4534	976.2612	(97)
Space heating kWh													
	383.5519	295.8594	228.1988	106.3540	29.3095	0.0000	0.0000	0.0000	0.0000	124.6909	271.0305	400.5165	(98a)
Space heating requirement - total per year (kWh/year)												1839.5115	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	383.5519	295.8594	228.1988	106.3540	29.3095	0.0000	0.0000	0.0000	0.0000	124.6909	271.0305	400.5165	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1839.5115	
Space heating per m2											(98c) / (4) =	35.0583	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	383.5519	295.8594	228.1988	106.3540	29.3095	0.0000	0.0000	0.0000	0.0000	124.6909	271.0305	400.5165	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	383.5519	295.8594	228.1988	106.3540	29.3095	0.0000	0.0000	0.0000	0.0000	124.6909	271.0305	400.5165	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1839.5115	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	613.9647	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2614.7262	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1839.5115	16.4900	303.3354	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	16.4900	101.2428	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	16.4900	5.5988	(249)
Energy for lighting	127.2974	16.4900	20.9913	(250)
Additional standing charges			0.0000	(251)
Total energy cost			431.1684	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.5925	(257)
SAP value		74.1856	
SAP rating (Section 12)		74	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1839.5115	0.1560	287.0161	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			373.6598	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			396.7424	(272)
CO2 emissions per m2			7.5600	(273)
EI value			94.5457	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0600	(17)
Infiltration rate		0.1530	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1300	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1398	0.1333	0.1333	0.1235	0.1268	0.1105	0.1105	0.1073	0.1105	0.1235	0.1203	0.1300	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.5900	1.1450	6.4008			(27)
Window			7.2900	1.1450	8.3473			(27)
Ground Floor			52.4700	0.1200	6.2964	110.0000	5771.7000	(28a)
Brickwork	44.6500	12.8800	31.7700	0.2100	6.6717	110.0000	3494.7002	(29a)
Communal Wall	30.0400	2.0600	27.9800	0.2100	5.8758	110.0000	3077.8001	(29a)
Lift Shaft Wall	9.5400		9.5400	0.1600	1.5264	110.0000	1049.4000	(29a)
Total net area of external elements Aum(A, m2)			136.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.5904			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17612.2702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		335.6636 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	25.8200	0.1120	2.8918
E7 Party floor between dwellings (in blocks of flats)	25.8200	0.0380	0.9812
E16 Corner (normal)	9.4500	0.0540	0.5103
E18 Party wall between dwellings	3.1500	0.0380	0.1197
P1 Party wall - Ground floor	5.1000	0.1080	0.5508
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.9400	0.0160	0.3030
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.0572 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	42.6476 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	64.7244	(39)
Average = Sum(39)m / 12 =												64.7244	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	1.2336	(40)
HLP (average)												1.2336	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7629	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)	100.8506	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):

Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
										Total per year (kWh/year) = Sum(64)m =		1992.4381	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains													
	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.5900	13.7804	0.3300	0.0000	0.7700	19.5740	(81)
West	7.2900	23.8018	0.3300	0.0000	0.7700	44.0901	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	63.6641	110.3430	185.8066	286.2709	353.0375	387.9167	363.3535	311.6491	233.9395	141.9046	78.4596	52.5139	(83)
Total gains	471.2574	516.2980	578.9169	654.9939	697.9765	711.1469	673.6397	624.3184	558.8163	488.7190	451.9858	449.4082	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	75.5866	
alpha	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	6.0391	
util living area													
	0.9951	0.9905	0.9712	0.8944	0.7128	0.4705	0.3169	0.3521	0.6694	0.9360	0.9890	0.9962	(86)
MIT	20.1102	20.2393	20.4949	20.7893	20.9575	20.9969	20.9998	20.9996	20.9774	20.7499	20.3735	20.0764	(87)
Th 2	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	19.8933	(88)
util rest of house													
	0.9929	0.9863	0.9583	0.8525	0.6310	0.3719	0.2107	0.2377	0.5586	0.8991	0.9830	0.9945	(89)
MIT 2	18.8953	19.0587	19.3758	19.7130	19.8684	19.8924	19.8932	19.8932	19.8840	19.6816	19.2298	18.8525	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.4450	19.5928	19.8821	20.2000	20.3612	20.3921	20.3939	20.3938	20.3787	20.1649	19.7473	19.4063	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4450	19.5928	19.8821	20.2000	20.3612	20.3921	20.3939	20.3938	20.3787	20.1649	19.7473	19.4063	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9917	0.9848	0.9581	0.8654	0.6670	0.4167	0.2588	0.2895	0.6090	0.9097	0.9820	0.9934	(94)
Useful gains	467.3605	508.4312	554.6692	566.8290	465.5283	296.3293	174.3234	180.7541	340.3213	444.6088	443.8508	446.4512	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	928.4708	899.2050	807.8976	666.6593	482.9184	297.2224	174.3602	180.8263	348.1328	560.8330	760.3349	925.9644	(97)
Space heating kWh													
	343.0661	262.5999	188.4019	71.8778	12.9382	0.0000	0.0000	0.0000	0.0000	86.4708	227.8686	356.7578	(98a)
Space heating requirement - total per year (kWh/year)												1549.9812	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	343.0661	262.5999	188.4019	71.8778	12.9382	0.0000	0.0000	0.0000	0.0000	86.4708	227.8686	356.7578	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1549.9812	
Space heating per m2											(98c) / (4) =	29.5403	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	343.0661	262.5999	188.4019	71.8778	12.9382	0.0000	0.0000	0.0000	0.0000	86.4708	227.8686	356.7578	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	343.0661	262.5999	188.4019	71.8778	12.9382	0.0000	0.0000	0.0000	0.0000	86.4708	227.8686	356.7578	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1549.9812 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	613.9647 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)	
mechanical ventilation fans (SFP = 0.2080)	33.9527 (230a)
Total electricity for the above, kWh/year	33.9527 (231)
Electricity for lighting (calculated in Appendix L)	127.2974 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2325.1960 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1549.9812	27.6700	428.8798	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	27.6700	169.8840	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	27.6700	9.3947	(249)
Energy for lighting	127.2974	27.6700	35.2232	(250)
Additional standing charges			0.0000	(251)
Total energy cost			643.3817	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1549.9812	0.1568	243.0673	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			329.7111	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			352.7937	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1549.9812	1.5806	2449.8509	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			3384.1994	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			3630.8160	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-36	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-36
Plot Address	Flat 8, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	69 C	**DER**	8.27	**TER**	15.73
Environmental	93 A	**% DER < TER**			47.43
CO_2 Emissions (t/year)	0.53	**DFEE**	49.15	**TFEE**	48.33
Compliance Check	See BREL	**% DFEE < TFEE**			-1.68
% DPER < TPER	-1.78	**DPER**	85.03	**TPER**	83.54

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	32.72 m	74.70 m²	2.55 m

8.0 Living Area	25.11	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	66.36	48.42	0.00	None	17.94	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	15.21	13.15	0.90	Stairwell Access Corridor 4	2.06	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	12.23	12.23	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	22.84	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	169.87

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	74.70

11.0 Heat Loss Floors

Summary for Input Data

elmhurst energy

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Exposed Floor	Exposed Floor - Solid	Lowest occupied	Other	0.14	Garage Single 1 Inside	0.70	0.00	74.70

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Patio Door	Brickwork	North East	5.42	
NW	Window	Brickwork	North West	9.79	
NE	Window	Brickwork	North East	2.72	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	32.72	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	14.40	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.76	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	2.88	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	7.49	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	28.20	0.02	0.02	RCD	Yes
E20 Exposed floor (normal)	Table K1 - Default	27.04	0.32	0.32	-	No
P8 Party Wall - Exposed floor (inverted)	Non Gov Approved Schemes	7.49	0.32	0.32	2/3 TK1	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	5.27	0.33	0.33	AbbeyCalculated	No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0
21.0 Fixed Cooling System	No
22.0 Pressure Testing	Yes

Summary for Input Data

elmhurst energy

Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.10	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	8
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1: SAP table

Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	

25.0 Main Heating 2: Database

Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	

26.0 Heat Networks: None

27.0 Secondary Heating: None

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
ENSUITE	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder: Internal Store

Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro: None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-36	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-36
Plot Address	Flat 8, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	69 C	**DER**	8.27	**TER**	15.73
Environmental	93 A	**% DER < TER**			47.43
CO_2 Emissions (t/year)	0.53	**DFEE**	49.15	**TFEE**	48.33
Compliance Check	See BREL	**% DFEE < TFEE**			-1.68
% DPER < TPER	-1.78	**DPER**	85.03	**TPER**	83.54

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1000	(17)
Infiltration rate		0.1550	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1318	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1680	0.1647	0.1614	0.1449	0.1416	0.1252	0.1252	0.1219	0.1318	0.1416	0.1482	0.1548	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Exposed Floor			74.7000	0.1275	9.5246	0.0000	0.0000	(28b)
Brickwork	66.3600	17.9300	48.4300	0.2100	10.1703	110.0000	5327.3001	(29a)
Communal Wall	15.2100	2.0600	13.1500	0.2000	2.6300	110.0000	1446.5000	(29a)
Lift Shaft Wall	12.2300		12.2300	0.1600	1.9568	110.0000	1345.2999	(29a)
Total net area of external elements Aum(A, m2)			168.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2842			(33)
Main dwelling								
Party Wall 1			22.8400	0.0000	0.0000	110.0000	2512.4000	(32)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14401.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							192.7889	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	32.7200	0.0380	1.2434	
E16 Corner (normal)	14.4000	0.0540	0.7776	
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587	
E18 Party wall between dwellings	2.8800	0.0380	0.1094	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E4 Jamb	28.2000	0.0160	0.4512	
E20 Exposed floor (normal)	27.0400	0.3200	8.6528	
P8 Party Wall - Exposed floor (inverted)	7.4900	0.3200	2.3968	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.2366	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	62.5208	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	(39)
Average = Sum(39)m / 12 =												93.9508	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	(40)
HLP (average)												1.2577	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	

Distribution loss (46)m = 0.15 x (45)m

30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
									Total per year (kWh/year) = Sum(64)m =		2301.5609	(64)
12Total per year (kWh/year)											2302	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9168	116.1579	104.9168	108.4140	104.9168	108.4140	104.9168	104.9168	108.4140	104.9168	108.4140	104.9168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains	463.2294	474.2558	453.0037	434.9013	410.6494	393.9932	377.3778	378.4747	391.2280	406.4287	434.1485	452.7703	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(75)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	51.4052	104.6368	188.5223	309.6077	416.1736	443.6851	415.0583	330.8893	229.7173	127.8745	64.6811	41.9801	(83)
Total gains	514.6346	578.8926	641.5260	744.5090	826.8229	837.6783	792.4361	709.3640	620.9453	534.3032	498.8296	494.7504	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	
alpha	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	
util living area													
	0.9906	0.9844	0.9698	0.9220	0.8146	0.6468	0.5002	0.5702	0.8100	0.9528	0.9845	0.9920	(86)
MIT	19.1878	19.3869	19.7337	20.2294	20.6575	20.8982	20.9709	20.9526	20.7515	20.1992	19.6058	19.1391	(87)
Th 2	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	(88)
util rest of house													
	0.9882	0.9803	0.9614	0.8996	0.7631	0.5566	0.3818	0.4472	0.7367	0.9347	0.9796	0.9899	(89)
MIT 2	17.7781	18.0313	18.4696	19.0809	19.5732	19.8098	19.8631	19.8540	19.6874	19.0576	18.3120	17.7162	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	18.2520	18.4870	18.8945	19.4670	19.9377	20.1757	20.2355	20.2233	20.0451	19.4413	18.7469	18.1945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2520	18.4870	18.8945	19.4670	19.9377	20.1757	20.2355	20.2233	20.0451	19.4413	18.7469	18.1945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9830	0.9732	0.9518	0.8898	0.7663	0.5823	0.4212	0.4873	0.7494	0.9256	0.9727	0.9852	(94)
Useful gains	505.9033	563.3516	610.5779	662.4300	633.6188	487.7412	333.7390	345.6865	465.3221	494.5638	485.2187	487.4419	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1310.8003	1276.5061	1164.4728	992.7748	773.9382	523.8405	341.5552	359.1990	558.5431	830.6513	1094.2391	1314.7954	(97)
Space heating kWh													
	598.8434	479.2398	412.0978	237.8483	104.3976	0.0000	0.0000	0.0000	0.0000	250.0491	438.4947	615.5510	(98a)
Space heating requirement - total per year (kWh/year)												3136.5217	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	598.8434	479.2398	412.0978	237.8483	104.3976	0.0000	0.0000	0.0000	0.0000	250.0491	438.4947	615.5510	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3136.5217	
Space heating per m2											(98c) / (4) =	41.9882	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	598.8434	479.2398	412.0978	237.8483	104.3976	0.0000	0.0000	0.0000	0.0000	250.0491	438.4947	615.5510	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	598.8434	479.2398	412.0978	237.8483	104.3976	0.0000	0.0000	0.0000	0.0000	250.0491	438.4947	615.5510	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3136.5217	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	709.2200	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4066.4188	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3136.5217	0.1548	485.6878	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			585.8176	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			617.3965	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3136.5217	1.5733	4934.6850	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			6014.1588	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			6351.6238	(286)
Dwelling Primary energy Rate (DPER)			85.0300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	190.4850	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1575	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4075	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3464	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3723	0.3291	0.3291	0.3204	0.3464	0.3723	0.3897	0.4070	(22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			16.6100	1.1450	19.0191			(27)
Exposed Floor			74.7000	0.1300	9.7110			(28b)
Brickwork	66.3600	16.6100	49.7500	0.1800	8.9550			(29a)
Communal Wall	15.2100	2.0600	13.1500	0.1800	2.3670			(29a)
Lift Shaft Wall	12.2300		12.2300	0.1800	2.2014			(29a)
Total net area of external elements Aum(A, m2)			168.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3135			(33)
Main dwelling								
Party Wall 1			22.8400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 192.7889 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	32.7200	0.0700	2.2904	
E16 Corner (normal)	14.4000	0.0900	1.2960	
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184	
E18 Party wall between dwellings	2.8800	0.0600	0.1728	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E4 Jamb	28.2000	0.0500	1.4100	
E20 Exposed floor (normal)	27.0400	0.3200	8.6528	
P8 Party Wall - Exposed floor (inverted)	7.4900	0.2400	1.7976	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.0200	0.1054	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.6316 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.9451 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.5598	37.3217	37.0884	35.9926	35.7875	34.8331	34.8331	34.6563	35.2007	35.7875	36.2023	36.6359	(38)
Heat transfer coeff	97.5049	97.2668	97.0335	95.9377	95.7326	94.7782	94.7782	94.6014	95.1458	95.7326	96.1474	96.5810	(39)

Average = Sum(39)m / 12 = 95.9367

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3053	1.3021	1.2990	1.2843	1.2816	1.2688	1.2688	1.2664	1.2737	1.2816	1.2871	1.2929	(40)
HLP (average)												1.2843	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	252.4175	223.1938	236.8779	207.5392	200.7241	180.3575	177.5526	184.8368	187.1391	209.3051	223.3528	249.5509	(62)
WWHRS	-29.1205	-25.7544	-26.9686	-22.3310	-20.8117	-17.8087	-16.6928	-17.7512	-18.4256	-21.7218	-24.6081	-28.5813	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
										Total per year (kWh/year) = Sum(64)m =		2262.2716	(64)
12Total per year (kWh/year)												2262	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	105.7120	93.8870	100.5450	90.0872	88.5239	81.0493	80.8194	83.2414	83.3042	91.3771	95.3452	104.7588	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9227	116.1644	104.9227	108.4201	104.9227	108.4201	104.9227	104.9227	108.4201	104.9227	108.4201	104.9227	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	142.0860	139.7128	135.1411	125.1212	118.9837	112.5685	108.6282	111.8835	115.7003	122.8186	132.4240	140.8048	(72)
Total internal gains	516.3373	527.3644	506.1117	488.0095	463.7573	444.1014	427.4858	428.5826	441.3361	459.5367	487.2567	505.8783	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.5400	11.2829	0.6300	0.7000	0.7700	25.9995	(75)
Northwest	9.0700	11.2829	0.6300	0.7000	0.7700	31.2753	(81)

Solar gains	57.2748	116.5846	210.0483	344.9597	463.6935	494.3463	462.4508	368.6712	255.9472	142.4756	72.0666	46.7735	(83)
Total gains	573.6121	643.9489	716.1600	832.9691	927.4508	938.4477	889.9366	797.2538	697.2833	602.0123	559.3232	552.6518	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.0274	41.1278	41.2267	41.6976	41.7869	42.2077	42.2077	42.2866	42.0446	41.7869	41.6066	41.4198	
alpha	3.7352	3.7419	3.7484	3.7798	3.7858	3.8138	3.8138	3.8191	3.8030	3.7858	3.7738	3.7613	
util living area	0.9868	0.9785	0.9593	0.8987	0.7746	0.5971	0.4544	0.5199	0.7673	0.9353	0.9779	0.9885	(86)
MIT	19.2010	19.4140	19.7791	20.2987	20.7074	20.9210	20.9784	20.9647	20.7929	20.2637	19.6578	19.1724	(87)
Th 2	19.8367	19.8392	19.8416	19.8531	19.8553	19.8654	19.8654	19.8672	19.8615	19.8553	19.8509	19.8464	(88)
util rest of house	0.9833	0.9729	0.9483	0.8715	0.7182	0.5083	0.3437	0.4032	0.6879	0.9119	0.9712	0.9855	(89)
MIT 2	17.7704	18.0418	18.5024	19.1440	19.6049	19.8170	19.8574	19.8528	19.7115	19.1191	18.3614	17.7404	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	18.2513	18.5030	18.9316	19.5322	19.9755	20.1881	20.2343	20.2265	20.0750	19.5039	18.7972	18.2218	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2513	18.5030	18.9316	19.5322	19.9755	20.1881	20.2343	20.2265	20.0750	19.5039	18.7972	18.2218	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9766	0.9641	0.9372	0.8625	0.7247	0.5347	0.3806	0.4416	0.7045	0.9029	0.9627	0.9794	(94)
Useful gains	560.2041	620.8552	671.1587	718.4591	672.1303	501.8238	338.7354	352.0863	491.2159	543.5429	538.4348	541.2554	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1360.3162	1323.1225	1206.2783	1020.0238	792.2360	529.6322	344.4486	361.9967	568.4986	852.3922	1124.6539	1354.2390	(97)
Space heating kWh	595.2834	471.9236	398.1290	217.1266	89.3586	0.0000	0.0000	0.0000	0.0000	229.7839	422.0778	604.8598	(98a)
Space heating requirement - total per year (kWh/year)												3028.5427	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	595.2834	471.9236	398.1290	217.1266	89.3586	0.0000	0.0000	0.0000	0.0000	229.7839	422.0778	604.8598	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3028.5427	
Space heating per m2											(98c) / (4) =	40.5427	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	595.2834	471.9236	398.1290	217.1266	89.3586	0.0000	0.0000	0.0000	0.0000	229.7839	422.0778	604.8598	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	644.9441	511.2932	431.3423	235.2401	96.8133	0.0000	0.0000	0.0000	0.0000	248.9533	457.2890	655.3194	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1496	85.9410	85.4721	84.4173	82.5774	79.8000	79.8000	79.8000	79.8000	84.5160	85.7056	86.1987	(217)
Fuel for water heating, kWh/month	259.1969	229.7382	245.5880	219.3961	217.8712	203.6952	201.5786	209.3805	211.4205	221.9502	231.8923	256.3490	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.8009	17.4895	15.7473	11.5372	8.9116	7.2809	8.1295	10.5670	13.7255	18.0086	20.3407	22.4068	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.9677	-29.5587	-44.5885	-52.6945	-59.0695	-55.9571	-55.2710	-51.0586	-44.0274	-34.9131	-22.4455	-17.1027	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.3762	-15.8411	-32.0983	-49.1222	-65.8540	-66.5011	-65.7222	-55.2354	-39.9463	-22.9547	-9.9436	-5.8093	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3281.1947	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2708.0567	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.9455	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-923.0586	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5328.1382	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3281.1947	0.2100	689.0509	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2708.0567	0.2100	568.6919	(264)
Space and water heating			1257.7428	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.9455	0.1443	25.3944	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6542	0.1336	-65.0037	
PV Unit electricity exported	-436.4044	0.1253	-54.7028	
Total			-119.7065	(269)
Total CO2, kg/year			1175.3599	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3281.1947	1.1300	3707.7500	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2708.0567	1.1300	3060.1040	(278)
Space and water heating			6767.8541	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.9455	1.5338	269.8711	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6542	1.4936	-726.8688	
PV Unit electricity exported	-436.4044	0.4601	-200.7854	
Total			-927.6542	(283)
Total Primary energy kWh/year			6240.1717	(286)
Target Primary Energy Rate (TPER)			83.5400	(287)

Full SAP Calculation Printout

Plot Reference	P-36	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-36
Plot Address	Flat 8, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	69 C	**DER**	8.27	**TER**	15.73
Environmental	93 A	**% DER < TER**			47.43
CO_2 Emissions (t/year)	0.53	**DFEE**	49.15	**TFEE**	48.33
Compliance Check	See BREL	**% DFEE < TFEE**			-1.68
% DPER < TPER	-1.78	**DPER**	85.03	**TPER**	83.54

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1575	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1000	(17)
Infiltration rate		0.3125	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2656	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3387	0.3320	0.3254	0.2922	0.2855	0.2523	0.2523	0.2457	0.2656	0.2855	0.2988	0.3121	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5573	0.5551	0.5529	0.5427	0.5408	0.5318	0.5318	0.5302	0.5353	0.5408	0.5446	0.5487	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Exposed Floor			74.7000	0.1275	9.5246	0.0000	0.0000	(28b)
Brickwork	66.3600	17.9300	48.4300	0.2100	10.1703	110.0000	5327.3001	(29a)
Communal Wall	15.2100	2.0600	13.1500	0.2000	2.6300	110.0000	1446.5000	(29a)
Lift Shaft Wall	12.2300		12.2300	0.1600	1.9568	110.0000	1345.2999	(29a)
Total net area of external elements Aum(A, m2)			168.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2842			(33)
Main dwelling								
Party Wall 1			22.8400	0.0000	0.0000	110.0000	2512.4000	(32)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14401.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							192.7889	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	32.7200	0.0380	1.2434
E16 Corner (normal)	14.4000	0.0540	0.7776
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E20 Exposed floor (normal)	27.0400	0.3200	8.6528
P8 Party Wall - Exposed floor (inverted)	7.4900	0.3200	2.3968
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2366 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.5208 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0348	34.8949	34.7576	34.1132	33.9926	33.4313	33.4313	33.3274	33.6475	33.9926	34.2365	34.4916	(38)
Heat transfer coeff	97.5556	97.4157	97.2785	96.6340	96.5134	95.9521	95.9521	95.8482	96.1683	96.5134	96.7573	97.0124	(39)
Average = Sum(39)m / 12 =												96.6334	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3060	1.3041	1.3023	1.2936	1.2920	1.2845	1.2845	1.2831	1.2874	1.2920	1.2953	1.2987	(40)
HLP (average)												1.2936	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 60.7331 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	66.2596	64.4421	62.4578	59.9878	57.7845	55.4946	55.0188	56.9991	59.0301	61.3817	63.8734	66.1666	(44)
Energy conte	104.9390	91.7647	95.9952	82.1204	77.7890	68.2371	66.5404	70.5768	72.7901	83.2943	90.9994	103.6009	(45)
Energy content (annual)										Total = Sum(45)m =		1008.6473	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(64)
										Total per year (kWh/year) = Sum(64)m =		857.3502	(64)
12Total per year (kWh/year)												857	(64)
Electric shower(s)													
	51.0123	45.4524	49.6322	47.3634	48.2522	46.0279	47.5622	48.2522	47.3634	49.6322	48.6990	51.0123	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		580.2617	(64a)
Heat gains from water heating, kWh/month													
	35.0526	30.8631	32.8070	29.2914	28.5932	26.0074	26.0304	27.0606	27.3087	30.1081	31.5121	34.7683	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9168	116.1579	104.9168	108.4140	104.9168	108.4140	104.9168	104.9168	108.4140	104.9168	108.4140	104.9168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	47.1137	45.9272	44.0955	40.6825	38.4317	36.1213	34.9871	36.3718	37.9288	40.4679	43.7668	46.7315	(72)
Total internal gains	418.3592	430.5722	412.0601	400.5647	380.1995	367.6482	353.8388	353.0650	363.5585	374.1800	395.5934	408.7991	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(75)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	51.4052	104.6368	188.5223	309.6077	416.1736	443.6851	415.0583	330.8893	229.7173	127.8745	64.6811	41.9801	(83)
Total gains	469.7644	535.2091	600.5824	710.1725	796.3730	811.3332	768.8970	683.9542	593.2759	502.0545	460.2745	450.7791	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.0060	41.0650	41.1229	41.3971	41.4488	41.6913	41.6913	41.7365	41.5976	41.4488	41.3443	41.2357	
alpha	3.7337	3.7377	3.7415	3.7598	3.7633	3.7794	3.7794	3.7824	3.7732	3.7633	3.7563	3.7490	
util living area	0.9931	0.9881	0.9760	0.9336	0.8345	0.6696	0.5218	0.5950	0.8323	0.9617	0.9882	0.9941	(86)
MIT	19.0313	19.2390	19.6031	20.1405	20.6043	20.8796	20.9644	20.9423	20.7114	20.1153	19.4894	18.9960	(87)
Th 2	19.8362	19.8376	19.8391	19.8458	19.8471	19.8530	19.8530	19.8541	19.8507	19.8471	19.8445	19.8419	(88)
util rest of house	0.9913	0.9848	0.9691	0.9135	0.7850	0.5779	0.3978	0.4675	0.7619	0.9463	0.9844	0.9926	(89)
MIT 2	18.0583	18.2655	18.6265	19.1515	19.5734	19.7931	19.8424	19.8348	19.6790	19.1383	18.5207	18.0272	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	18.3854	18.5928	18.9547	19.4839	19.9199	20.1583	20.2195	20.2071	20.0260	19.4667	18.8463	18.3528	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3854	18.5928	18.9547	19.4839	19.9199	20.1583	20.2195	20.2071	20.0260	19.4667	18.8463	18.3528	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9880	0.9800	0.9621	0.9059	0.7885	0.6040	0.4391	0.5092	0.7743	0.9397	0.9798	0.9896	(94)
Useful gains	464.1091	524.5134	577.8423	643.3167	627.9775	490.0773	337.6410	348.2654	459.3829	471.7754	450.9659	446.1030	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1374.1070	1333.8903	1211.5775	1022.7684	793.3346	533.3319	347.3031	364.9011	569.8935	855.7561	1136.5418	1373.0004	(97)
Space heating kWh	677.0384	543.9013	471.4990	273.2052	123.0257	0.0000	0.0000	0.0000	0.0000	285.6816	493.6147	689.6116	(98a)
Space heating requirement - total per year (kWh/year)												3557.5776	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	677.0384	543.9013	471.4990	273.2052	123.0257	0.0000	0.0000	0.0000	0.0000	285.6816	493.6147	689.6116	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3557.5776	
Space heating per m2											(98c) / (4) =	47.6249	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	901.9499	710.0457	728.4461	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7936	0.8594	0.8091	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	715.7788	610.2136	589.4121	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	908.4293	860.8761	763.6339	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	138.7084	186.4928	129.6210	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.6771	46.6232	32.4053	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												113.7056	(107)
Energy for space heating												47.6249	(99)
Energy for space cooling												1.5222	(108)
Total												49.1470	(109)
Fabric Energy Efficiency (DFEE)												49.1	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		190.4850	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												30.0000 / (5) =	0.1575 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.4075 (18)
Number of sides sheltered													2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4416	0.4330	0.4243	0.3810	0.3723	0.3291	0.3291	0.3204	0.3464	0.3723	0.3897	0.4070	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			16.6100	1.1450	19.0191			(27)
Exposed Floor			74.7000	0.1300	9.7110			(28b)
Brickwork	66.3600	16.6100	49.7500	0.1800	8.9550			(29a)
Communal Wall	15.2100	2.0600	13.1500	0.1800	2.3670			(29a)
Lift Shaft Wall	12.2300		12.2300	0.1800	2.2014			(29a)
Total net area of external elements Aum(A, m2)			168.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3135			(33)
Main dwelling								
Party Wall 1			22.8400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 192.7889 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.7200	0.0700	2.2904
E16 Corner (normal)	14.4000	0.0900	1.2960
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184
E18 Party wall between dwellings	2.8800	0.0600	0.1728
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0500	1.4100
E20 Exposed floor (normal)	27.0400	0.3200	8.6528
P8 Party Wall - Exposed floor (inverted)	7.4900	0.2400	1.7976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.0200	0.1054

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.6316 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 59.9451 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.5598	37.3217	37.0884	35.9926	35.7875	34.8331	34.8331	34.6563	35.2007	35.7875	36.2023	36.6359	(38)
Heat transfer coeff													
	97.5049	97.2668	97.0335	95.9377	95.7326	94.7782	94.7782	94.6014	95.1458	95.7326	96.1474	96.5810	(39)
Average = Sum(39)m / 12 =												95.9367	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3053	1.3021	1.2990	1.2843	1.2816	1.2688	1.2688	1.2664	1.2737	1.2816	1.2871	1.2929	(40)
HLP (average)												1.2843	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 60.7331 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	66.2596	64.4421	62.4578	59.9878	57.7845	55.4946	55.0188	56.9991	59.0301	61.3817	63.8734	66.1666	(44)
Energy conte	104.9390	91.7647	95.9952	82.1204	77.7890	68.2371	66.5404	70.5768	72.7901	83.2943	90.9994	103.6009	(45)
Energy content (annual)										Total = Sum(45)m =		1008.6473	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(64)
										Total per year (kWh/year) = Sum(64)m =		857.3502	(64)
12Total per year (kWh/year)												857	(64)
Electric shower(s)													
	51.0123	45.4524	49.6322	47.3634	48.2522	46.0279	47.5622	48.2522	47.3634	49.6322	48.6990	51.0123	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		580.2617	(64a)

Heat gains from water heating, kWh/month

	35.0526	30.8631	32.8070	29.2914	28.5932	26.0074	26.0304	27.0606	27.3087	30.1081	31.5121	34.7683 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.9227	116.1644	104.9227	108.4201	104.9227	108.4201	104.9227	104.9227	108.4201	104.9227	108.4201	104.9227	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)

Water heating gains (Table 5)

	47.1137	45.9272	44.0955	40.6825	38.4317	36.1213	34.9871	36.3718	37.9288	40.4679	43.7668	46.7315	(72)

Total internal gains

	418.3651	430.5788	412.0660	400.5709	380.2054	367.6543	353.8447	353.0709	363.5647	374.1860	395.5996	408.8050	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.5400	11.2829	0.6300	0.7000	0.7700	25.9995	(75)
Northwest	9.0700	11.2829	0.6300	0.7000	0.7700	31.2753	(81)

Solar gains	57.2748	116.5846	210.0483	344.9597	463.6935	494.3463	462.4508	368.6712	255.9472	142.4756	72.0666	46.7735	(83)
Total gains	475.6399	547.1633	622.1143	745.5305	843.8989	862.0006	816.2955	721.7421	619.5118	516.6615	467.6661	455.5785	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.0274	41.1278	41.2267	41.6976	41.7869	42.2077	42.2077	42.2866	42.0446	41.7869	41.6066	41.4198	
alpha	3.7352	3.7419	3.7484	3.7798	3.7858	3.8138	3.8138	3.8191	3.8030	3.7858	3.7738	3.7613	
util living area	0.9928	0.9872	0.9733	0.9237	0.8117	0.6368	0.4908	0.5650	0.8141	0.9580	0.9876	0.9939	(86)
MIT	19.0421	19.2615	19.6408	20.1967	20.6505	20.9016	20.9720	20.9532	20.7406	20.1478	19.5130	19.0137	(87)
Th 2	19.8367	19.8392	19.8416	19.8531	19.8553	19.8654	19.8654	19.8672	19.8615	19.8553	19.8509	19.8464	(88)
util rest of house	0.9909	0.9837	0.9656	0.9015	0.7592	0.5463	0.3733	0.4420	0.7409	0.9415	0.9835	0.9923	(89)
MIT 2	18.0694	18.2888	18.6650	19.2089	19.6170	19.8173	19.8572	19.8519	19.7094	19.1751	18.5486	18.0480	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	18.3964	18.6158	18.9930	19.5409	19.9644	20.1818	20.2319	20.2221	20.0560	19.5021	18.8728	18.3727	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3964	18.6158	18.9930	19.5409	19.9644	20.1818	20.2319	20.2221	20.0560	19.5021	18.8728	18.3727	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9787	0.9583	0.8942	0.7648	0.5730	0.4125	0.4825	0.7551	0.9349	0.9788	0.9893	(94)
Useful gains	469.6926	535.4979	596.1778	666.6890	645.4139	493.9335	336.7168	348.2157	467.8173	483.0015	457.7531	450.7029	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1374.4633	1334.0934	1212.2404	1020.8677	791.1703	529.0295	344.2270	361.5721	566.6884	852.2180	1131.9253	1368.8102	(97)
Space heating kWh	673.1494	536.6562	458.3506	255.0087	108.4428	0.0000	0.0000	0.0000	0.0000	274.6971	485.4040	683.0719	(98a)
Space heating requirement - total per year (kWh/year)												3474.7805	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	673.1494	536.6562	458.3506	255.0087	108.4428	0.0000	0.0000	0.0000	0.0000	274.6971	485.4040	683.0719	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3474.7805	
Space heating per m2										(98c) / (4) =		46.5165	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	890.9148	701.3584	718.9708	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8237	0.8831	0.8359	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	733.8100	619.3572	601.0207	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	967.6443	916.2705	807.7953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	168.3607	220.9035	153.8403	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.0902	55.2259	38.4601	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												135.7761	(107)
Energy for space heating												46.5165	(99)
Energy for space cooling												1.8176	(108)
Total												48.3341	(109)
Fabric Energy Efficiency (TFEE)												48.3	(109)

Full SAP Calculation Printout

Plot Reference	P-36	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-36
Plot Address	Flat 8, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	69 C	**DER**	8.27	**TER**	15.73
Environmental	93 A	**% DER < TER**			47.43
CO_2 Emissions (t/year)	0.53	**DFEE**	49.15	**TFEE**	48.33
Compliance Check	See BREL	**% DFEE < TFEE**			-1.68
% DPER < TPER	-1.78	**DPER**	85.03	**TPER**	83.54

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1000	(17)
Infiltration rate		0.1550	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1318	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1680	0.1647	0.1614	0.1449	0.1416	0.1252	0.1252	0.1219	0.1318	0.1416	0.1482	0.1548	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Exposed Floor			74.7000	0.1275	9.5246	0.0000	0.0000	(28b)
Brickwork	66.3600	17.9300	48.4300	0.2100	10.1703	110.0000	5327.3001	(29a)
Communal Wall	15.2100	2.0600	13.1500	0.2000	2.6300	110.0000	1446.5000	(29a)
Lift Shaft Wall	12.2300		12.2300	0.1600	1.9568	110.0000	1345.2999	(29a)
Total net area of external elements Aum(A, m2)			168.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2842			(33)
Main dwelling								
Party Wall 1			22.8400	0.0000	0.0000	110.0000	2512.4000	(32)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14401.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							192.7889	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	32.7200	0.0380	1.2434	
E16 Corner (normal)	14.4000	0.0540	0.7776	
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587	
E18 Party wall between dwellings	2.8800	0.0380	0.1094	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E4 Jamb	28.2000	0.0160	0.4512	
E20 Exposed floor (normal)	27.0400	0.3200	8.6528	
P8 Party Wall - Exposed floor (inverted)	7.4900	0.3200	2.3968	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.2366	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	62.5208	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	(39)
Average = Sum(39)m / 12 =												93.9508	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	(40)
HLP (average)												1.2577	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	

Distribution loss (46)m = 0.15 x (45)m

30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
									Total per year (kWh/year) = Sum(64)m =		2301.5609	(64)
12Total per year (kWh/year)											2302	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9168	116.1579	104.9168	108.4140	104.9168	108.4140	104.9168	104.9168	108.4140	104.9168	108.4140	104.9168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains	463.2294	474.2558	453.0037	434.9013	410.6494	393.9932	377.3778	378.4747	391.2280	406.4287	434.1485	452.7703	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(75)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	51.4052	104.6368	188.5223	309.6077	416.1736	443.6851	415.0583	330.8893	229.7173	127.8745	64.6811	41.9801	(83)
Total gains	514.6346	578.8926	641.5260	744.5090	826.8229	837.6783	792.4361	709.3640	620.9453	534.3032	498.8296	494.7504	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	
alpha	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	
util living area													
	0.9906	0.9844	0.9698	0.9220	0.8146	0.6468	0.5002	0.5702	0.8100	0.9528	0.9845	0.9920	(86)
MIT	19.1878	19.3869	19.7337	20.2294	20.6575	20.8982	20.9709	20.9526	20.7515	20.1992	19.6058	19.1391	(87)
Th 2	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	(88)
util rest of house													
	0.9882	0.9803	0.9614	0.8996	0.7631	0.5566	0.3818	0.4472	0.7367	0.9347	0.9796	0.9899	(89)
MIT 2	17.7781	18.0313	18.4696	19.0809	19.5732	19.8098	19.8631	19.8540	19.6874	19.0576	18.3120	17.7162	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	18.2520	18.4870	18.8945	19.4670	19.9377	20.1757	20.2355	20.2233	20.0451	19.4413	18.7469	18.1945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2520	18.4870	18.8945	19.4670	19.9377	20.1757	20.2355	20.2233	20.0451	19.4413	18.7469	18.1945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9830	0.9732	0.9518	0.8898	0.7663	0.5823	0.4212	0.4873	0.7494	0.9256	0.9727	0.9852	(94)
Useful gains	505.9033	563.3516	610.5779	662.4300	633.6188	487.7412	333.7390	345.6865	465.3221	494.5638	485.2187	487.4419	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1310.8003	1276.5061	1164.4728	992.7748	773.9382	523.8405	341.5552	359.1990	558.5431	830.6513	1094.2391	1314.7954	(97)
Space heating kWh													
	598.8434	479.2398	412.0978	237.8483	104.3976	0.0000	0.0000	0.0000	0.0000	250.0491	438.4947	615.5510	(98a)
Space heating requirement - total per year (kWh/year)												3136.5217	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	598.8434	479.2398	412.0978	237.8483	104.3976	0.0000	0.0000	0.0000	0.0000	250.0491	438.4947	615.5510	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3136.5217	
Space heating per m2											(98c) / (4) =	41.9882	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	598.8434	479.2398	412.0978	237.8483	104.3976	0.0000	0.0000	0.0000	0.0000	250.0491	438.4947	615.5510	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	598.8434	479.2398	412.0978	237.8483	104.3976	0.0000	0.0000	0.0000	0.0000	250.0491	438.4947	615.5510	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3136.5217	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	709.2200	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4066.4188	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3136.5217	0.1548	485.6878	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			585.8176	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			617.3965	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3136.5217	1.5733	4934.6850	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			6014.1588	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			6351.6238	(286)
Dwelling Primary energy Rate (DPER)			85.0300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	190.4850	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1575	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4075	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3464	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3723	0.3291	0.3291	0.3204	0.3464	0.3723	0.3897	0.4070	(22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			16.6100	1.1450	19.0191			(27)
Exposed Floor			74.7000	0.1300	9.7110			(28b)
Brickwork	66.3600	16.6100	49.7500	0.1800	8.9550			(29a)
Communal Wall	15.2100	2.0600	13.1500	0.1800	2.3670			(29a)
Lift Shaft Wall	12.2300		12.2300	0.1800	2.2014			(29a)
Total net area of external elements Aum(A, m2)			168.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3135			(33)
Main dwelling								
Party Wall 1			22.8400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 192.7889 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	32.7200	0.0700	2.2904	
E16 Corner (normal)	14.4000	0.0900	1.2960	
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184	
E18 Party wall between dwellings	2.8800	0.0600	0.1728	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E4 Jamb	28.2000	0.0500	1.4100	
E20 Exposed floor (normal)	27.0400	0.3200	8.6528	
P8 Party Wall - Exposed floor (inverted)	7.4900	0.2400	1.7976	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.0200	0.1054	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.6316 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.9451 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.5598	37.3217	37.0884	35.9926	35.7875	34.8331	34.8331	34.6563	35.2007	35.7875	36.2023	36.6359	(38)
Heat transfer coeff	97.5049	97.2668	97.0335	95.9377	95.7326	94.7782	94.7782	94.6014	95.1458	95.7326	96.1474	96.5810	(39)

Average = Sum(39)m / 12 = 95.9367

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3053	1.3021	1.2990	1.2843	1.2816	1.2688	1.2688	1.2664	1.2737	1.2816	1.2871	1.2929	(40)
HLP (average)												1.2843	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	252.4175	223.1938	236.8779	207.5392	200.7241	180.3575	177.5526	184.8368	187.1391	209.3051	223.3528	249.5509	(62)
WWHRS	-29.1205	-25.7544	-26.9686	-22.3310	-20.8117	-17.8087	-16.6928	-17.7512	-18.4256	-21.7218	-24.6081	-28.5813	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
										Total per year (kWh/year) = Sum(64)m =		2262.2716	(64)
12Total per year (kWh/year)												2262	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	105.7120	93.8870	100.5450	90.0872	88.5239	81.0493	80.8194	83.2414	83.3042	91.3771	95.3452	104.7588	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9227	116.1644	104.9227	108.4201	104.9227	108.4201	104.9227	104.9227	108.4201	104.9227	108.4201	104.9227	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	142.0860	139.7128	135.1411	125.1212	118.9837	112.5685	108.6282	111.8835	115.7003	122.8186	132.4240	140.8048	(72)
Total internal gains	516.3373	527.3644	506.1117	488.0095	463.7573	444.1014	427.4858	428.5826	441.3361	459.5367	487.2567	505.8783	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.5400	11.2829	0.6300	0.7000	0.7700	25.9995	(75)
Northwest	9.0700	11.2829	0.6300	0.7000	0.7700	31.2753	(81)

Solar gains	57.2748	116.5846	210.0483	344.9597	463.6935	494.3463	462.4508	368.6712	255.9472	142.4756	72.0666	46.7735	(83)
Total gains	573.6121	643.9489	716.1600	832.9691	927.4508	938.4477	889.9366	797.2538	697.2833	602.0123	559.3232	552.6518	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.0274	41.1278	41.2267	41.6976	41.7869	42.2077	42.2077	42.2866	42.0446	41.7869	41.6066	41.4198	
alpha	3.7352	3.7419	3.7484	3.7798	3.7858	3.8138	3.8138	3.8191	3.8030	3.7858	3.7738	3.7613	
util living area	0.9868	0.9785	0.9593	0.8987	0.7746	0.5971	0.4544	0.5199	0.7673	0.9353	0.9779	0.9885	(86)
MIT	19.2010	19.4140	19.7791	20.2987	20.7074	20.9210	20.9784	20.9647	20.7929	20.2637	19.6578	19.1724	(87)
Th 2	19.8367	19.8392	19.8416	19.8531	19.8553	19.8654	19.8654	19.8672	19.8615	19.8553	19.8509	19.8464	(88)
util rest of house	0.9833	0.9729	0.9483	0.8715	0.7182	0.5083	0.3437	0.4032	0.6879	0.9119	0.9712	0.9855	(89)
MIT 2	17.7704	18.0418	18.5024	19.1440	19.6049	19.8170	19.8574	19.8528	19.7115	19.1191	18.3614	17.7404	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	18.2513	18.5030	18.9316	19.5322	19.9755	20.1881	20.2343	20.2265	20.0750	19.5039	18.7972	18.2218	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2513	18.5030	18.9316	19.5322	19.9755	20.1881	20.2343	20.2265	20.0750	19.5039	18.7972	18.2218	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9766	0.9641	0.9372	0.8625	0.7247	0.5347	0.3806	0.4416	0.7045	0.9029	0.9627	0.9794	(94)
Useful gains	560.2041	620.8552	671.1587	718.4591	672.1303	501.8238	338.7354	352.0863	491.2159	543.5429	538.4348	541.2554	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1360.3162	1323.1225	1206.2783	1020.0238	792.2360	529.6322	344.4486	361.9967	568.4986	852.3922	1124.6539	1354.2390	(97)
Space heating kWh	595.2834	471.9236	398.1290	217.1266	89.3586	0.0000	0.0000	0.0000	0.0000	229.7839	422.0778	604.8598	(98a)
Space heating requirement - total per year (kWh/year)												3028.5427	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	595.2834	471.9236	398.1290	217.1266	89.3586	0.0000	0.0000	0.0000	0.0000	229.7839	422.0778	604.8598	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3028.5427	
Space heating per m2											(98c) / (4) =	40.5427	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	595.2834	471.9236	398.1290	217.1266	89.3586	0.0000	0.0000	0.0000	0.0000	229.7839	422.0778	604.8598	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	644.9441	511.2932	431.3423	235.2401	96.8133	0.0000	0.0000	0.0000	0.0000	248.9533	457.2890	655.3194	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1496	85.9410	85.4721	84.4173	82.5774	79.8000	79.8000	79.8000	79.8000	84.5160	85.7056	86.1987	(217)
Fuel for water heating, kWh/month	259.1969	229.7382	245.5880	219.3961	217.8712	203.6952	201.5786	209.3805	211.4205	221.9502	231.8923	256.3490	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.8009	17.4895	15.7473	11.5372	8.9116	7.2809	8.1295	10.5670	13.7255	18.0086	20.3407	22.4068	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.9677	-29.5587	-44.5885	-52.6945	-59.0695	-55.9571	-55.2710	-51.0586	-44.0274	-34.9131	-22.4455	-17.1027	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.3762	-15.8411	-32.0983	-49.1222	-65.8540	-66.5011	-65.7222	-55.2354	-39.9463	-22.9547	-9.9436	-5.8093	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3281.1947	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2708.0567	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.9455	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-923.0586	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5328.1382	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3281.1947	0.2100	689.0509	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2708.0567	0.2100	568.6919	(264)
Space and water heating			1257.7428	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.9455	0.1443	25.3944	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6542	0.1336	-65.0037	
PV Unit electricity exported	-436.4044	0.1253	-54.7028	
Total			-119.7065	(269)
Total CO2, kg/year			1175.3599	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3281.1947	1.1300	3707.7500	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2708.0567	1.1300	3060.1040	(278)
Space and water heating			6767.8541	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.9455	1.5338	269.8711	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6542	1.4936	-726.8688	
PV Unit electricity exported	-436.4044	0.4601	-200.7854	
Total			-927.6542	(283)
Total Primary energy kWh/year			6240.1717	(286)
Target Primary Energy Rate (TPER)			83.5400	(287)

Full SAP Calculation Printout

Plot Reference	P-36	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-36
Plot Address	Flat 8, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	69 C	**DER**	8.27	**TER**	15.73
Environmental	93 A	**% DER < TER**			47.43
CO_2 Emissions (t/year)	0.53	**DFEE**	49.15	**TFEE**	48.33
Compliance Check	See BREL	**% DFEE < TFEE**			-1.68
% DPER < TPER	-1.78	**DPER**	85.03	**TPER**	83.54

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.1000 (17)
Infiltration rate		0.1550 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1318 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1680	0.1647	0.1614	0.1449	0.1416	0.1252	0.1252	0.1219	0.1318	0.1416	0.1482	0.1548	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Exposed Floor			74.7000	0.1275	9.5246	0.0000	0.0000	(28b)
Brickwork	66.3600	17.9300	48.4300	0.2100	10.1703	110.0000	5327.3001	(29a)
Communal Wall	15.2100	2.0600	13.1500	0.2000	2.6300	110.0000	1446.5000	(29a)
Lift Shaft Wall	12.2300		12.2300	0.1600	1.9568	110.0000	1345.2999	(29a)
Total net area of external elements Aum(A, m2)			168.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2842			(33)
Main dwelling								
Party Wall 1			22.8400	0.0000	0.0000	110.0000	2512.4000	(32)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14401.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		192.7889 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.7200	0.0380	1.2434
E16 Corner (normal)	14.4000	0.0540	0.7776
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E20 Exposed floor (normal)	27.0400	0.3200	8.6528
P8 Party Wall - Exposed floor (inverted)	7.4900	0.3200	2.3968
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2366 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.5208 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	(39)
Average = Sum(39)m / 12 =												93.9508	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	(40)
HLP (average)												1.2577	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	

Distribution loss (46)m = 0.15 x (45)m

30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
									Total per year (kWh/year) = Sum(64)m =		2301.5609	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(75)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	51.4052	104.6368	188.5223	309.6077	416.1736	443.6851	415.0583	330.8893	229.7173	127.8745	64.6811	41.9801	(83)
Total gains	576.8221	628.1744	695.3233	784.8246	860.0677	859.1060	813.5186	732.1111	646.9208	573.7604	545.3576	553.0955	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	
alpha	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	
util living area	0.9863	0.9797	0.9615	0.9104	0.7995	0.6350	0.4888	0.5556	0.7941	0.9421	0.9793	0.9883	(86)
MIT	19.2889	19.4649	19.8130	20.2775	20.6816	20.9045	20.9731	20.9566	20.7699	20.2531	19.6794	19.2347	(87)
Th 2	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	(88)
util rest of house	0.9828	0.9744	0.9511	0.8857	0.7462	0.5450	0.3724	0.4345	0.7185	0.9208	0.9730	0.9853	(89)
MIT 2	17.9063	18.1293	18.5674	19.1366	19.5971	19.8142	19.8640	19.8559	19.7035	19.1211	18.4042	17.8375	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	18.3710	18.5782	18.9861	19.5201	19.9616	20.1807	20.2368	20.2259	20.0620	19.5016	18.8328	18.3071	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3710	18.5782	18.9861	19.5201	19.9616	20.1807	20.2368	20.2259	20.0620	19.5016	18.8328	18.3071	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9762	0.9662	0.9406	0.8764	0.7508	0.5710	0.4112	0.4741	0.7327	0.9119	0.9649	0.9794	(94)
Useful gains	563.1014	606.9303	654.0010	687.8078	645.7363	490.5186	334.4792	347.1240	474.0097	523.1852	526.2285	541.6745	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1321.9848	1285.0805	1173.0794	997.7660	776.1866	524.3155	341.6809	359.4428	560.1315	836.3125	1102.3080	1325.3782	(97)
Space heating kWh	564.6092	455.7170	386.1943	223.1698	97.0551	0.0000	0.0000	0.0000	0.0000	232.9667	414.7773	583.0755	(98a)
Space heating requirement - total per year (kWh/year)												2957.5649	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	564.6092	455.7170	386.1943	223.1698	97.0551	0.0000	0.0000	0.0000	0.0000	232.9667	414.7773	583.0755	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2957.5649	
Space heating per m2											(98c) / (4) =	39.5926	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	564.6092	455.7170	386.1943	223.1698	97.0551	0.0000	0.0000	0.0000	0.0000	232.9667	414.7773	583.0755	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	564.6092	455.7170	386.1943	223.1698	97.0551	0.0000	0.0000	0.0000	0.0000	232.9667	414.7773	583.0755	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2957.5649	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												709.2200	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3887.4619	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2957.5649	16.4900	487.7025	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	16.4900	116.9504	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	16.4900	7.9708	(249)
Energy for lighting	172.3395	16.4900	28.4188	(250)
Additional standing charges			0.0000	(251)
Total energy cost			641.0425	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.9279	(257)
SAP value		68.7480	
SAP rating (Section 12)		69	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2957.5649	0.1549	458.1145	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			558.2443	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			589.8232	(272)
CO2 emissions per m2			7.9000	(273)
EI value			93.3971	
EI rating			93	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		190.4850	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50												3.1000	(17)
Infiltration rate												0.1550	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1318	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1416	0.1350	0.1350	0.1252	0.1285	0.1120	0.1120	0.1087	0.1120	0.1252	0.1219	0.1318	(22b)

Mechanical extract ventilation - centralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Exposed Floor			74.7000	0.1275	9.5246	0.0000	0.0000	(28b)
Brickwork	66.3600	17.9300	48.4300	0.2100	10.1703	110.0000	5327.3001	(29a)
Communal Wall	15.2100	2.0600	13.1500	0.2000	2.6300	110.0000	1446.5000	(29a)
Lift Shaft Wall	12.2300		12.2300	0.1600	1.9568	110.0000	1345.2999	(29a)
Total net area of external elements Aum(A, m2)			168.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2842			(33)
Main dwelling								
Party Wall 1			22.8400	0.0000	0.0000	110.0000	2512.4000	(32)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14401.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		192.7889 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.7200	0.0380	1.2434
E16 Corner (normal)	14.4000	0.0540	0.7776
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E20 Exposed floor (normal)	27.0400	0.3200	8.6528
P8 Party Wall - Exposed floor (inverted)	7.4900	0.3200	2.3968
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.2366 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	62.5208 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	(39)
Average = Sum(39)m / 12 =												93.9508	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	(40)
HLP (average)												1.2577	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3546	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)
Hot water usage for baths	27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)
Hot water usage for other uses	38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)
Average daily hot water use (litres/day)												119.4615	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)

											Total per year (kWh/year) = Sum(64)m =	2301.5609	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829		(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)													
	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains													
	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(75)
Northeast	2.7200	13.7804	0.3300	0.0000	0.7700	9.5244	(75)
Northwest	9.7900	13.7804	0.3300	0.0000	0.7700	34.2807	(81)

Solar gains	62.7838	112.2881	201.6306	335.8449	438.2676	493.1378	457.2361	375.0305	261.9555	147.5831	77.9598	51.4724	(83)
Total gains	588.2006	635.8257	708.4316	811.0618	882.1618	908.5587	855.6964	776.2523	679.1589	593.4690	558.6363	562.5878	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	
alpha	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	
util living area													
	0.9829	0.9752	0.9509	0.8797	0.7311	0.5135	0.3576	0.4034	0.7138	0.9188	0.9724	0.9852	(86)
MIT	19.4332	19.6014	19.9664	20.4364	20.8014	20.9624	20.9931	20.9892	20.8650	20.4058	19.8397	19.3924	(87)
Th 2	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	(88)
util rest of house													
	0.9783	0.9685	0.9372	0.8464	0.6628	0.4123	0.2380	0.2738	0.6174	0.8882	0.9636	0.9812	(89)
MIT 2	18.0900	18.3024	18.7588	19.3239	19.7192	19.8562	19.8727	19.8717	19.7894	19.3040	18.6067	18.0386	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	18.5415	18.7391	19.1647	19.6978	20.0830	20.2281	20.2493	20.2473	20.1510	19.6744	19.0212	18.4937	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5415	18.7391	19.1647	19.6978	20.0830	20.2281	20.2493	20.2473	20.1510	19.6744	19.0212	18.4937	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9708	0.9595	0.9263	0.8403	0.6765	0.4452	0.2784	0.3176	0.6434	0.8815	0.9546	0.9743	(94)
Useful gains	571.0450	610.0768	656.2450	681.5421	596.7755	404.5120	238.2077	246.5710	436.9431	523.1300	533.2790	548.1416	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
1262.8442	1225.0308	1105.3043	920.5150	674.8472	416.0207	239.5106	248.7204	483.9369	767.9909	1035.4480	1258.3448		(97)
Space heating kWh													
514.6986	413.2491	334.1001	172.0605	58.0854	0.0000	0.0000	0.0000	0.0000	182.1765	361.5616	528.3912		(98a)
Space heating requirement - total per year (kWh/year)												2564.3231	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
514.6986	413.2491	334.1001	172.0605	58.0854	0.0000	0.0000	0.0000	0.0000	182.1765	361.5616	528.3912		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2564.3231	
Space heating per m2											(98c) / (4) =	34.3283	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	514.6986	413.2491	334.1001	172.0605	58.0854	0.0000	0.0000	0.0000	0.0000	182.1765	361.5616	528.3912	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)
514.6986 413.2491 334.1001 172.0605 58.0854 0.0000 0.0000 0.0000 0.0000 182.1765 361.5616 528.3912 (211)
Space heating efficiency (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (212)
Space heating fuel (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (213)
Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
232.7740 205.4512 217.2344 188.5294 181.0806 161.3476 157.9091 165.1933 168.1293 189.6616 204.3430 229.9074 (64)
Efficiency of water heater 324.5200 (216)
(217)m 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 (217)
Fuel for water heating, kWh/month
71.7287 63.3093 66.9402 58.0948 55.7995 49.7189 48.6593 50.9039 51.8086 58.4437 62.9678 70.8454 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 4.1054 3.7081 4.1054 3.9729 4.1054 3.9729 4.1054 4.1054 3.9729 4.1054 3.9729 4.1054 (231)
Lighting 21.3541 17.1310 15.4246 11.3007 8.7290 7.1317 7.9629 10.3505 13.4442 17.6395 19.9238 21.9476 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 2564.3231 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 709.2200 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 48.3375 (230a)
Total electricity for the above, kWh/year 48.3375 (231)
Electricity for lighting (calculated in Appendix L) 172.3395 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 3494.2201 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2564.3231	27.6700	709.5482	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	27.6700	196.2412	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	27.6700	13.3750	(249)
Energy for lighting	172.3395	27.6700	47.6863	(250)
Additional standing charges			0.0000	(251)
Total energy cost			966.8507	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2564.3231	0.1556	398.9045	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			499.0344	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			530.6133	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2564.3231	1.5759	4041.1935	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			5120.6672	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			5458.1323	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 69
Current environmental impact rating: A 93

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: C 69
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£967	£967	£0
Space heating	£723	£723	£0
Water heating	£196	£196	£0
Lighting	£48	£48	£0
Total cost of fuels	£967	£967	£0
Total cost of uses	£967	£967	£0
Delivered energy	47 kWh/m²	47 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	73 kWh/m²	73 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1000	(17)
Infiltration rate		0.1550	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1318	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1680	0.1647	0.1614	0.1449	0.1416	0.1252	0.1252	0.1219	0.1318	0.1416	0.1482	0.1548	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Exposed Floor			74.7000	0.1275	9.5246	0.0000	0.0000	(28b)
Brickwork	66.3600	17.9300	48.4300	0.2100	10.1703	110.0000	5327.3001	(29a)
Communal Wall	15.2100	2.0600	13.1500	0.2000	2.6300	110.0000	1446.5000	(29a)
Lift Shaft Wall	12.2300		12.2300	0.1600	1.9568	110.0000	1345.2999	(29a)
Total net area of external elements Aum(A, m2)			168.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2842			(33)
Main dwelling								
Party Wall 1			22.8400	0.0000	0.0000	110.0000	2512.4000	(32)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14401.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		192.7889 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.7200	0.0380	1.2434
E16 Corner (normal)	14.4000	0.0540	0.7776
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E20 Exposed floor (normal)	27.0400	0.3200	8.6528
P8 Party Wall - Exposed floor (inverted)	7.4900	0.3200	2.3968
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.2366 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	62.5208 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	(39)
Average = Sum(39)m / 12 =												93.9508	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	(40)
HLP (average)												1.2577	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.3546 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)
Average daily hot water use (litres/day)												119.4615	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):		
Store volume		200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.6100 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
									Total per year (kWh/year) = Sum(64)m =		2301.5609	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850 (71)
Water heating gains (Table 5)												
	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028 (72)
Total internal gains												
	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(75)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	51.4052	104.6368	188.5223	309.6077	416.1736	443.6851	415.0583	330.8893	229.7173	127.8745	64.6811	41.9801	(83)
Total gains	576.8221	628.1744	695.3233	784.8246	860.0677	859.1060	813.5186	732.1111	646.9208	573.7604	545.3576	553.0955	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	
alpha	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	
util living area													
	0.9863	0.9797	0.9615	0.9104	0.7995	0.6350	0.4888	0.5556	0.7941	0.9421	0.9793	0.9883	(86)
MIT	19.2889	19.4649	19.8130	20.2775	20.6816	20.9045	20.9731	20.9566	20.7699	20.2531	19.6794	19.2347	(87)
Th 2	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	(88)
util rest of house													
	0.9828	0.9744	0.9511	0.8857	0.7462	0.5450	0.3724	0.4345	0.7185	0.9208	0.9730	0.9853	(89)
MIT 2	17.9063	18.1293	18.5674	19.1366	19.5971	19.8142	19.8640	19.8559	19.7035	19.1211	18.4042	17.8375	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	18.3710	18.5782	18.9861	19.5201	19.9616	20.1807	20.2368	20.2259	20.0620	19.5016	18.8328	18.3071	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3710	18.5782	18.9861	19.5201	19.9616	20.1807	20.2368	20.2259	20.0620	19.5016	18.8328	18.3071	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9762	0.9662	0.9406	0.8764	0.7508	0.5710	0.4112	0.4741	0.7327	0.9119	0.9649	0.9794	(94)
Useful gains	563.1014	606.9303	654.0010	687.8078	645.7363	490.5186	334.4792	347.1240	474.0097	523.1852	526.2285	541.6745	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1321.9848	1285.0805	1173.0794	997.7660	776.1866	524.3155	341.6809	359.4428	560.1315	836.3125	1102.3080	1325.3782	(97)
Space heating kWh													
	564.6092	455.7170	386.1943	223.1698	97.0551	0.0000	0.0000	0.0000	0.0000	232.9667	414.7773	583.0755	(98a)
Space heating requirement - total per year (kWh/year)												2957.5649	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	564.6092	455.7170	386.1943	223.1698	97.0551	0.0000	0.0000	0.0000	0.0000	232.9667	414.7773	583.0755	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2957.5649	
Space heating per m2											(98c) / (4) =	39.5926	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	564.6092	455.7170	386.1943	223.1698	97.0551	0.0000	0.0000	0.0000	0.0000	232.9667	414.7773	583.0755	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	564.6092	455.7170	386.1943	223.1698	97.0551	0.0000	0.0000	0.0000	0.0000	232.9667	414.7773	583.0755	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2957.5649	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	709.2200	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3887.4619	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2957.5649	16.4900	487.7025	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	16.4900	116.9504	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	16.4900	7.9708	(249)
Energy for lighting	172.3395	16.4900	28.4188	(250)
Additional standing charges			0.0000	(251)
Total energy cost			641.0425	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.9279	(257)
SAP value		68.7480	
SAP rating (Section 12)		69	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2957.5649	0.1549	458.1145	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			558.2443	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			589.8232	(272)
CO2 emissions per m2			7.9000	(273)
EI value			93.3971	
EI rating			93	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b) x	2.5500	(2b) =	190.4850	(1b) - (3b)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 74.7000 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 190.4850 (5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1000	(17)
Infiltration rate		0.1550	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1318	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1416	0.1350	0.1350	0.1252	0.1285	0.1120	0.1120	0.1087	0.1120	0.1252	0.1219	0.1318	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Exposed Floor			74.7000	0.1275	9.5246	0.0000	0.0000	(28b)
Brickwork	66.3600	17.9300	48.4300	0.2100	10.1703	110.0000	5327.3001	(29a)
Communal Wall	15.2100	2.0600	13.1500	0.2000	2.6300	110.0000	1446.5000	(29a)
Lift Shaft Wall	12.2300		12.2300	0.1600	1.9568	110.0000	1345.2999	(29a)
Total net area of external elements Aum(A, m2)			168.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2842			(33)
Main dwelling								
Party Wall 1			22.8400	0.0000	0.0000	110.0000	2512.4000	(32)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14401.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 192.7889 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.7200	0.0380	1.2434
E16 Corner (normal)	14.4000	0.0540	0.7776
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E20 Exposed floor (normal)	27.0400	0.3200	8.6528
P8 Party Wall - Exposed floor (inverted)	7.4900	0.3200	2.3968
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2366 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.5208 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	93.9508	(39)
Average = Sum(39)m / 12 =												93.9508	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	1.2577	(40)
HLP (average)												1.2577	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers	63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)
Hot water usage for baths	27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)
Hot water usage for other uses	38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)
Average daily hot water use (litres/day)												119.4615	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use

	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m													
	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
										Total per year (kWh/year) = Sum(64)m =		2301.5609	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)													
	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains													
	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(75)
Northeast	2.7200	13.7804	0.3300	0.0000	0.7700	9.5244	(75)
Northwest	9.7900	13.7804	0.3300	0.0000	0.7700	34.2807	(81)

Solar gains	62.7838	112.2881	201.6306	335.8449	438.2676	493.1378	457.2361	375.0305	261.9555	147.5831	77.9598	51.4724	(83)
Total gains	588.2006	635.8257	708.4316	811.0618	882.1618	908.5587	855.6964	776.2523	679.1589	593.4690	558.6363	562.5878	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	42.5794	
alpha	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	3.8386	
util living area													
	0.9829	0.9752	0.9509	0.8797	0.7311	0.5135	0.3576	0.4034	0.7138	0.9188	0.9724	0.9852	(86)
MIT	19.4332	19.6014	19.9664	20.4364	20.8014	20.9624	20.9931	20.9892	20.8650	20.4058	19.8397	19.3924	(87)
Th 2	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	19.8741	(88)
util rest of house													
	0.9783	0.9685	0.9372	0.8464	0.6628	0.4123	0.2380	0.2738	0.6174	0.8882	0.9636	0.9812	(89)
MIT 2	18.0900	18.3024	18.7588	19.3239	19.7192	19.8562	19.8727	19.8717	19.7894	19.3040	18.6067	18.0386	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	18.5415	18.7391	19.1647	19.6978	20.0830	20.2281	20.2493	20.2473	20.1510	19.6744	19.0212	18.4937	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5415	18.7391	19.1647	19.6978	20.0830	20.2281	20.2493	20.2473	20.1510	19.6744	19.0212	18.4937	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9708	0.9595	0.9263	0.8403	0.6765	0.4452	0.2784	0.3176	0.6434	0.8815	0.9546	0.9743	(94)
Useful gains	571.0450	610.0768	656.2450	681.5421	596.7755	404.5120	238.2077	246.5710	436.9431	523.1300	533.2790	548.1416	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1262.8442	1225.0308	1105.3043	920.5150	674.8472	416.0207	239.5106	248.7204	483.9369	767.9909	1035.4480	1258.3448	(97)
Space heating kWh													
	514.6986	413.2491	334.1001	172.0605	58.0854	0.0000	0.0000	0.0000	0.0000	182.1765	361.5616	528.3912	(98a)
Space heating requirement - total per year (kWh/year)												2564.3231	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

514.6986	413.2491	334.1001	172.0605	58.0854	0.0000	0.0000	0.0000	0.0000	182.1765	361.5616	528.3912	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2564.3231

Space heating per m2 (98c) / (4) = 34.3283 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	514.6986	413.2491	334.1001	172.0605	58.0854	0.0000	0.0000	0.0000	0.0000	182.1765	361.5616	528.3912	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	514.6986	413.2491	334.1001	172.0605	58.0854	0.0000	0.0000	0.0000	0.0000	182.1765	361.5616	528.3912	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	2564.3231	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	709.2200	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3494.2201	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2564.3231	27.6700	709.5482	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	27.6700	196.2412	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	27.6700	13.3750	(249)
Energy for lighting	172.3395	27.6700	47.6863	(250)
Additional standing charges			0.0000	(251)
Total energy cost			966.8507	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2564.3231	0.1556	398.9045	(261)

Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			499.0344	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			530.6133	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2564.3231	1.5759	4041.1935	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			5120.6672	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			5458.1323	(286)

Summary for Input Data

Plot Reference	P-37	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-37
Plot Address	Flat 9, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.71	**TER**	13.28
Environmental	96 A	**% DER < TER**			57.00
CO_2 Emissions (t/year)	0.26	**DFEE**	30.81	**TFEE**	30.19
Compliance Check	See BREL	**% DFEE < TFEE**			-2.05
% DPER < TPER	16.53	**DPER**	58.90	**TPER**	70.57

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	33.89 m	55.10 m²	2.55 m

8.0 Living Area 25.44 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	54.45	39.77	0.00	None	14.68	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	18.08	15.93	0.90	Stairwell Access Corridor 4	2.15	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	9.61	9.61	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	25.54	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	122.68

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	54.18

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	54.18

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Flat Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Flat Door	Communal Wall	West	2.15	
Patio Door	Patio Door	Brickwork	South East	6.50	
SE	Window	Brickwork	South East	5.45	
SW	Window	Brickwork	South West	2.72	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	48.34	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	14.44	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	8.64	-0.10	-0.10	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	7.14	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	23.40	0.02	0.02	RCD	Yes
E18 Party wall between dwellings	Gov Approved Scheme	5.76	0.04	0.04		No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	15.12	0.00	0.02		No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.30	0.33	0.33	AbbeyCalculated	No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa

Summary for Input Data

Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.72	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	6
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day
34.0 Small-scale Hydro	None	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-37	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-37
Plot Address	Flat 9, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.71	**TER**	13.28
Environmental	96 A	**% DER < TER**			57.00
CO_2 Emissions (t/year)	0.26	**DFEE**	30.81	**TFEE**	30.19
Compliance Check	See BREL	**% DFEE < TFEE**			-2.05
% DPER < TPER	16.53	**DPER**	58.90	**TPER**	70.57

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000 (1b)	x	2.5500 (2b)	=	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.7200	(17)
Infiltration rate			0.1360	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1156	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1474	0.1445	0.1416	0.1272	0.1243	0.1098	0.1098	0.1069	0.1156	0.1243	0.1300	0.1358	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2000	3.1860	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
Total net area of external elements Aum(A, m2)			82.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4551			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.1800			70.0000	3792.6000	(32d)
Party Ceiling 1			54.1800			30.0000	1625.4000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16516.7201	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	299.7590	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	48.3400	0.0380	1.8369
E16 Corner (normal)	14.4400	0.0540	0.7798
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.1200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1479 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.6030 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	(39)
Average = Sum(39)m / 12 =												59.7863	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	(40)
HLP (average)												1.0851	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)
Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)											Total = Sum(45)m =	1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
											Total per year (kWh/year) = Sum(64)m =	2032.8510	(64)
12Total per year (kWh/year)												2033	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9252	89.5958	80.9252	83.6227	80.9252	83.6227	80.9252	80.9252	83.6227	80.9252	83.6227	80.9252	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains	371.4998	379.7838	362.9654	348.0681	328.7897	315.3442	302.1606	303.3100	313.5027	325.8913	348.1680	363.3129	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5000	36.7938	0.3300	0.0000	0.7700	60.7705	(77)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Southwest	2.7200	36.7938	0.3300	0.0000	0.7700	25.4301	(79)

Solar gains	137.1544	233.6247	319.6555	396.0687	443.6299	440.4219	424.6137	389.1308	346.1193	258.2051	164.2794	117.3756	(83)
Total gains	508.6542	613.4085	682.6209	744.1368	772.4197	755.7660	726.7742	692.4409	659.6221	584.0963	512.4474	480.6885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	
alpha	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	
util living area	0.9920	0.9760	0.9397	0.8470	0.6899	0.5024	0.3615	0.3963	0.6116	0.8849	0.9794	0.9942	(86)
MIT	20.1613	20.3820	20.6171	20.8419	20.9608	20.9950	20.9994	20.9990	20.9846	20.8218	20.4410	20.1058	(87)
Th 2	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	(88)
util rest of house	0.9891	0.9679	0.9208	0.8064	0.6273	0.4268	0.2807	0.3118	0.5304	0.8430	0.9710	0.9921	(89)
MIT 2	19.0622	19.3378	19.6222	19.8729	19.9858	20.0108	20.0129	20.0128	20.0051	19.8597	19.4150	18.9920	(90)
Living area fraction										fLA = Living area / (4) =		0.4617	(91)
MIT	19.5696	19.8199	20.0816	20.3203	20.4360	20.4652	20.4684	20.4681	20.4573	20.3039	19.8887	19.5063	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5696	19.8199	20.0816	20.3203	20.4360	20.4652	20.4684	20.4681	20.4573	20.3039	19.8887	19.5063	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9874	0.9660	0.9223	0.8199	0.6549	0.4617	0.3180	0.3509	0.5677	0.8565	0.9697	0.9906	(94)
Useful gains	502.2574	592.5571	629.5634	610.1460	505.8271	348.9358	231.1340	242.9563	374.4391	500.3067	496.9241	476.1938	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	912.9157	892.0072	811.9917	682.7778	522.2920	350.6585	231.2774	243.2189	380.0810	580.1595	764.5897	915.1046	(97)
Space heating kWh	305.5298	201.2305	135.7266	52.2949	12.2499	0.0000	0.0000	0.0000	0.0000	59.4105	192.7193	326.5496	(98a)
Space heating requirement - total per year (kWh/year)												1285.7112	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	305.5298	201.2305	135.7266	52.2949	12.2499	0.0000	0.0000	0.0000	0.0000	59.4105	192.7193	326.5496	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1285.7112	
Space heating per m2											(98c) / (4) =	23.3341	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	305.5298	201.2305	135.7266	52.2949	12.2499	0.0000	0.0000	0.0000	0.0000	59.4105	192.7193	326.5496	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	305.5298	201.2305	135.7266	52.2949	12.2499	0.0000	0.0000	0.0000	0.0000	59.4105	192.7193	326.5496	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1285.7112	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.6545	(230a)
Total electricity for the above, kWh/year	35.6545	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2080.7138	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1285.7112	0.1573	202.2676	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			290.6744	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			314.8061	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1285.7112	1.5824	2034.4609	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			2987.7822	(279)
Pumps, fans and electric keep-hot	35.6545	1.5128	53.9382	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			3245.6132	(286)
Dwelling Primary energy Rate (DPER)			58.9000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1423	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3923	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3335	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4252	0.4169	0.4085	0.3668	0.3585	0.3168	0.3168	0.3085	0.3335	0.3585	0.3752	0.3919	(22b)
Effective ac	0.5904	0.5869	0.5834	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.6300	1.1450	13.3168			(27)
Brickwork	54.4500	11.6300	42.8200	0.1800	7.7076			(29a)
Communal Wall	18.0800	2.1500	15.9300	0.1800	2.8674			(29a)
Stairwell Wall	9.6100		9.6100	0.1800	1.7298			(29a)
Total net area of external elements Aum(A, m2)			82.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.7716			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 299.7590 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	48.3400	0.0700	3.3838
E16 Corner (normal)	14.4400	0.0900	1.2996
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0900	-0.7776
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0500	1.1700
E18 Party wall between dwellings	5.7600	0.0600	0.3456
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.1200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8644 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 33.6360 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3748	27.2120	27.0525	26.3032	26.1630	25.5103	25.5103	25.3895	25.7617	26.1630	26.4466	26.7431	(38)
Heat transfer coeff	61.0108	60.8480	60.6885	59.9392	59.7990	59.1463	59.1463	59.0254	59.3977	59.7990	60.0826	60.3791	(39)

Average = Sum(39)m / 12 = 59.9385

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1073	1.1043	1.1014	1.0878	1.0853	1.0734	1.0734	1.0712	1.0780	1.0853	1.0904	1.0958	(40)
HLP (average)												1.0878	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.5439	198.6677	211.1098	185.5406	179.8522	162.0402	159.8182	166.1156	167.9022	187.2699	199.2117	222.0653	(62)
WWHRS -25.1780	-22.2677	-23.3174	-19.3077	-17.9941	-15.3977	-14.4329	-15.3479	-15.9311	-18.7810	-21.2765	-24.7118	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
									Total per year (kWh/year) = Sum(64)m =		2030.1935	(64)

12Total per year (kWh/year) 2030 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

96.4440	85.7321	91.9771	82.7727	81.5840	74.9588	74.9227	77.0166	76.9079	84.0504	87.3183	95.6198	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.1190	89.8104	81.1190	83.8230	81.1190	83.8230	81.1190	81.1190	83.8230	81.1190	83.8230	81.1190	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	129.6290	127.5775	123.6252	114.9621	109.6559	104.1094	100.7025	103.5169	106.8166	112.9709	121.2755	128.5213	(72)

Total internal gains

	424.7956	433.1004	416.2613	401.3704	382.0856	365.6465	352.4564	353.6059	363.8050	379.1871	401.4703	416.6088 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.4700	36.7938	0.6300	0.7000	0.7700	106.4871	(77)
Southwest	2.1600	36.7938	0.6300	0.7000	0.7700	24.2885	(79)

Solar gains	130.7756	222.7592	304.7888	377.6481	422.9973	419.9384	404.8655	371.0329	330.0218	246.1963	156.6390	111.9166 (83)
Total gains	555.5712	655.8596	721.0500	779.0185	805.0829	785.5849	757.3219	724.6388	693.8268	625.3834	558.1093	528.5254 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.1994	75.4006	75.5988	76.5439	76.7234	77.5700	77.5700	77.7288	77.2417	76.7234	76.3612	75.9862	
alpha	6.0133	6.0267	6.0399	6.1029	6.1149	6.1713	6.1713	6.1819	6.1494	6.1149	6.0907	6.0657	
util living area	0.9880	0.9687	0.9281	0.8267	0.6668	0.4791	0.3433	0.3742	0.5810	0.8570	0.9698	0.9907	(86)
MIT	20.2046	20.4170	20.6429	20.8621	20.9672	20.9963	20.9996	20.9993	20.9885	20.8541	20.5013	20.1680	(87)
Th 2	19.9949	19.9973	19.9997	20.0108	20.0129	20.0226	20.0226	20.0244	20.0188	20.0129	20.0087	20.0043	(88)
util rest of house	0.9837	0.9586	0.9065	0.7839	0.6047	0.4073	0.2672	0.2951	0.5029	0.8104	0.9582	0.9874	(89)
MIT 2	19.1023	19.3673	19.6397	19.8904	19.9904	20.0209	20.0225	20.0242	20.0130	19.8907	19.4843	19.0636	(90)
Living area fraction										fLA = Living area / (4) =		0.4617	(91)
MIT	19.6112	19.8520	20.1029	20.3390	20.4414	20.4713	20.4736	20.4744	20.4634	20.3355	19.9538	19.5735	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6112	19.8520	20.1029	20.3390	20.4414	20.4713	20.4736	20.4744	20.4634	20.3355	19.9538	19.5735	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9817	0.9568	0.9090	0.7990	0.6323	0.4404	0.3024	0.3316	0.5388	0.8269	0.9574	0.9856	(94)
Useful gains	545.4107	627.5527	655.4446	622.4079	509.0229	346.0031	229.0110	240.3193	373.8111	517.1272	534.3255	520.9097	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	934.1512	909.7982	825.5379	685.6462	522.7278	347.2637	229.1109	240.4951	377.9723	582.1737	772.2907	928.2372	(97)
Space heating kWh	289.2230	189.6690	126.5494	45.5316	10.1964	0.0000	0.0000	0.0000	0.0000	48.3946	171.3350	303.0517	(98a)
Space heating requirement - total per year (kWh/year)												1183.9505	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	289.2230	189.6690	126.5494	45.5316	10.1964	0.0000	0.0000	0.0000	0.0000	48.3946	171.3350	303.0517	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1183.9505	
Space heating per m2										(98c) / (4) =		21.4873	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	289.2230	189.6690	126.5494	45.5316	10.1964	0.0000	0.0000	0.0000	0.0000	48.3946	171.3350	303.0517	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	313.3510	205.4918	137.1066	49.3300	11.0470	0.0000	0.0000	0.0000	0.0000	52.4319	185.6283	328.3333	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8932	84.2227	83.1946	81.5777	80.2822	79.8000	79.8000	79.8000	79.8000	81.6464	83.9751	85.0184	(217)
Fuel for water heating, kWh/month	234.8431	209.4446	225.7268	203.7724	201.6114	183.7625	182.1872	188.9319	190.4401	206.3641	211.8904	232.1304	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8549	13.5217	12.1747	8.9197	6.8899	5.6291	6.2852	8.1697	10.6116	13.9230	15.7260	17.3234	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.8812	-22.1119	-33.4855	-39.7436	-44.7182	-42.4426	-41.9424	-38.6757	-33.2316	-26.2086	-16.7630	-12.7382	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.2881	-11.3757	-23.0800	-35.3581	-47.4275	-47.8846	-47.3043	-39.7286	-28.7089	-16.4757	-7.1278	-4.1621	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1282.7200	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2471.1049	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	136.0290	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-680.8639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3294.9899	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1282.7200	0.2100	269.3712	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2471.1049	0.2100	518.9320	(264)
Space and water heating			788.3032	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.0290	0.1443	19.6332	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9425	0.1335	-48.9795	
PV Unit electricity exported	-313.9214	0.1253	-39.3435	
Total			-88.3230	(269)
Total CO2, kg/year			731.5427	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1282.7200	1.1300	1449.4736	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2471.1049	1.1300	2792.3485	(278)
Space and water heating			4241.8221	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.0290	1.5338	208.6458	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9425	1.4933	-547.9393	
PV Unit electricity exported	-313.9214	0.4600	-144.4093	
Total			-692.3487	(283)
Total Primary energy kWh/year			3888.2200	(286)
Target Primary Energy Rate (TPER)			70.5700	(287)

Full SAP Calculation Printout

Plot Reference	P-37	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-37
Plot Address	Flat 9, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.71	**TER**	13.28
Environmental	96 A	**% DER < TER**			57.00
CO_2 Emissions (t/year)	0.26	**DFEE**	30.81	**TFEE**	30.19
Compliance Check	See BREL	**% DFEE < TFEE**			-2.05
% DPER < TPER	16.53	**DPER**	58.90	**TPER**	70.57

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1423 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7200 (17)
Infiltration rate		0.2783 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2366 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3017	0.2957	0.2898	0.2603	0.2543	0.2248	0.2248	0.2188	0.2366	0.2543	0.2662	0.2780	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5455	0.5437	0.5420	0.5339	0.5323	0.5253	0.5253	0.5239	0.5280	0.5323	0.5354	0.5386	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2000	3.1860	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
Total net area of external elements Aum(A, m2)			82.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4551			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.1800			70.0000	3792.6000	(32d)
Party Ceiling 1			54.1800			30.0000	1625.4000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16516.7201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		299.7590 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	48.3400	0.0380	1.8369	
E16 Corner (normal)	14.4400	0.0540	0.7798	
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381	
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570	
E4 Jamb	23.4000	0.0160	0.3744	
E18 Party wall between dwellings	5.7600	0.0380	0.2189	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.1200	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1479 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.6030 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.2929	25.2110	25.1307	24.7535	24.6830	24.3545	24.3545	24.2937	24.4810	24.6830	24.8257	24.9750	(38)
Heat transfer coeff	61.8959	61.8140	61.7337	61.3565	61.2860	60.9575	60.9575	60.8967	61.0840	61.2860	61.4287	61.5780	(39)

Average = Sum(39)m / 12 = 61.3562

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1233	1.1219	1.1204	1.1135	1.1123	1.1063	1.1063	1.1052	1.1086	1.1123	1.1149	1.1176	(40)
HLP (average)												1.1135	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 52.5062 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.2837	55.7128	53.9976	51.8622	49.9575	47.9779	47.5662	49.2780	51.0336	53.0666	55.2208	57.2032	(44)
Energy conte	90.7234	79.3343	82.9923	70.9968	67.2524	58.9945	57.5272	61.0164	62.9295	72.0108	78.6722	89.5665	(45)

Energy content (annual) Total = Sum(45)m = 872.0164

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(64)

Total per year (kWh/year) = Sum(64)m = 741.2139 (64)

12Total per year (kWh/year) 741 (64)

Electric shower(s)

44.1060	39.2988	42.9128	40.9511	41.7196	39.7964	41.1230	41.7196	40.9511	42.9128	42.1059	44.1060	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 501.7031 (64a)

Heat gains from water heating, kWh/month

30.3052	26.6832	28.3641	25.3246	24.7210	22.4854	22.5053	23.3959	23.6103	26.0305	27.2443	30.0594	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9252	89.5958	80.9252	83.6227	80.9252	83.6227	80.9252	80.9252	83.6227	80.9252	83.6227	80.9252	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	40.7328	39.7072	38.1237	35.1731	33.2272	31.2298	30.2490	31.4461	32.7921	34.9872	37.8393	40.4024	(72)
Total internal gains	332.7057	342.0155	327.5660	318.3811	302.4631	292.5666	281.8091	281.3413	289.5803	298.0096	314.8339	325.2961	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5000	36.7938	0.3300	0.0000	0.7700	60.7705	(77)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Southwest	2.7200	36.7938	0.3300	0.0000	0.7700	25.4301	(79)

Solar gains	137.1544	233.6247	319.6555	396.0687	443.6299	440.4219	424.6137	389.1308	346.1193	258.2051	164.2794	117.3756	(83)
Total gains	469.8601	575.6403	647.2215	714.4498	746.0930	732.9884	706.4228	670.4721	635.6996	556.2147	479.1133	442.6717	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.1241	74.2223	74.3189	74.7757	74.8618	75.2652	75.2652	75.3404	75.1093	74.8618	74.6878	74.5068	
alpha	5.9416	5.9482	5.9546	5.9850	5.9908	6.0177	6.0177	6.0227	6.0073	5.9908	5.9792	5.9671	
util living area	0.9949	0.9834	0.9551	0.8727	0.7215	0.5266	0.3790	0.4165	0.6430	0.9083	0.9859	0.9964	(86)
MIT	20.0442	20.2754	20.5323	20.7990	20.9465	20.9930	20.9992	20.9986	20.9784	20.7765	20.3551	19.9973	(87)
Th 2	19.9818	19.9830	19.9842	19.9898	19.9908	19.9957	19.9957	19.9966	19.9938	19.9908	19.9887	19.9865	(88)
util rest of house	0.9930	0.9775	0.9398	0.8351	0.6577	0.4467	0.2929	0.3264	0.5581	0.8712	0.9798	0.9950	(89)
MIT 2	19.1309	19.3589	19.6056	19.8481	19.9614	19.9932	19.9955	19.9963	19.9850	19.8370	19.4439	19.0882	(90)
Living area fraction										fLA = Living area / (4) =		0.4617	(91)
MIT	19.5526	19.7820	20.0335	20.2872	20.4162	20.4548	20.4589	20.4590	20.4437	20.2708	19.8646	19.5080	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5526	19.7820	20.0335	20.2872	20.4162	20.4548	20.4589	20.4590	20.4437	20.2708	19.8646	19.5080	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9920	0.9761	0.9407	0.8471	0.6856	0.4836	0.3327	0.3681	0.5970	0.8827	0.9789	0.9941	(94)
Useful gains	466.0944	561.8578	608.8312	605.2089	511.4862	354.4695	235.0201	246.7988	379.5145	490.9592	468.9894	440.0766	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	944.0741	919.9182	835.4710	698.6767	534.1825	356.8942	235.2300	247.1822	387.4962	592.6824	784.1144	942.6327	(97)
Space heating kWh	355.6169	240.6166	168.6200	67.2968	16.8860	0.0000	0.0000	0.0000	0.0000	75.6821	226.8900	373.9018	(98a)

Space heating requirement - total per year (kWh/year) 1525.5102

Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh	355.6169	240.6166	168.6200	67.2968	16.8860	0.0000	0.0000	0.0000	0.0000	75.6821	226.8900	373.9018	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1525.5102

Space heating per m2 (98c) / (4) = 27.6862 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	573.0004	451.0855	462.8146	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9636	0.9857	0.9793	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	552.1151	444.6359	453.2570	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	827.4930	798.0395	757.5722	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	198.2721	262.9323	226.4104	0.0000	0.0000	0.0000	0.0000	(104)

Cooled fraction fC = cooled area / (4) = 1.0000 (105)

Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	49.5680	65.7331	56.6026	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement 171.9037 (107)

Energy for space heating 27.6862 (99)

Energy for space cooling 3.1198 (108)

Total 30.8061 (109)

Fabric Energy Efficiency (DFEE) 30.8 (109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1423	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3923	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3335	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4252	0.4169	0.4085	0.3668	0.3585	0.3168	0.3168	0.3085	0.3335	0.3585	0.3752	0.3919	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5904	0.5869	0.5834	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.6300	1.1450	13.3168			(27)
Brickwork	54.4500	11.6300	42.8200	0.1800	7.7076			(29a)
Communal Wall	18.0800	2.1500	15.9300	0.1800	2.8674			(29a)
Stairwell Wall	9.6100		9.6100	0.1800	1.7298			(29a)
Total net area of external elements Aum(A, m2)			82.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.7716			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	299.7590	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	48.3400	0.0700	3.3838
E16 Corner (normal)	14.4400	0.0900	1.2996
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0900	-0.7776
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0500	1.1700
E18 Party wall between dwellings	5.7600	0.0600	0.3456
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.1200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.8644	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 33.6360	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3748	27.2120	27.0525	26.3032	26.1630	25.5103	25.5103	25.3895	25.7617	26.1630	26.4466	26.7431	(38)
Heat transfer coeff	61.0108	60.8480	60.6885	59.9392	59.7990	59.1463	59.1463	59.0254	59.3977	59.7990	60.0826	60.3791	(39)
Average = Sum(39)m / 12 =												59.9385	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1073	1.1043	1.1014	1.0878	1.0853	1.0734	1.0734	1.0712	1.0780	1.0853	1.0904	1.0958	(40)
HLP (average)												1.0878	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8403	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day)	52.5062	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.2837	55.7128	53.9976	51.8622	49.9575	47.9779	47.5662	49.2780	51.0336	53.0666	55.2208	57.2032	(44)
Energy conte	90.7234	79.3343	82.9923	70.9968	67.2524	58.9945	57.5272	61.0164	62.9295	72.0108	78.6722	89.5665	(45)
Energy content (annual)										Total = Sum(45)m =		872.0164	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(64)
									Total per year (kWh/year) = Sum(64)m =		741.2139	(64)
12Total per year (kWh/year)											741	(64)

Electric shower(s)

44.1060	39.2988	42.9128	40.9511	41.7196	39.7964	41.1230	41.7196	40.9511	42.9128	42.1059	44.1060	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 501.7031 (64a)

Heat gains from water heating, kWh/month

30.3052	26.6832	28.3641	25.3246	24.7210	22.4854	22.5053	23.3959	23.6103	26.0305	27.2443	30.0594	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.1190	89.8104	81.1190	83.8230	81.1190	83.8230	81.1190	81.1190	83.8230	81.1190	83.8230	81.1190	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)													
	40.7328	39.7072	38.1237	35.1731	33.2272	31.2298	30.2490	31.4461	32.7921	34.9872	37.8393	40.4024	(72)
Total internal gains													
	332.8995	342.2301	327.7598	318.5814	302.6569	292.7668	282.0029	281.5351	289.7806	298.2034	315.0342	325.4899	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.4700	36.7938	0.6300	0.7000	0.7700	106.4871	(77)
Southwest	2.1600	36.7938	0.6300	0.7000	0.7700	24.2885	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	130.7756	222.7592	304.7888	377.6481	422.9973	419.9384	404.8655	371.0329	330.0218	246.1963	156.6390	111.9166	(83)
Total gains	463.6751	564.9893	632.5486	696.2295	725.6542	712.7053	686.8684	652.5680	619.8024	544.3998	471.6731	437.4065	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.1994	75.4006	75.5988	76.5439	76.7234	77.5700	77.5700	77.7288	77.2417	76.7234	76.3612	75.9862	
alpha	6.0133	6.0267	6.0399	6.1029	6.1149	6.1713	6.1713	6.1819	6.1494	6.1149	6.0907	6.0657	
util living area													
	0.9952	0.9843	0.9576	0.8761	0.7250	0.5261	0.3783	0.4150	0.6427	0.9098	0.9864	0.9965	(86)
MIT	20.0566	20.2829	20.5354	20.8043	20.9490	20.9939	20.9993	20.9988	20.9804	20.7850	20.3723	20.0192	(87)
Th 2	19.9949	19.9973	19.9997	20.0108	20.0129	20.0226	20.0226	20.0244	20.0188	20.0129	20.0087	20.0043	(88)
util rest of house													
	0.9934	0.9787	0.9430	0.8394	0.6621	0.4482	0.2946	0.3276	0.5596	0.8734	0.9805	0.9952	(89)
MIT 2	19.1539	19.3782	19.6223	19.8724	19.9846	20.0204	20.0225	20.0241	20.0108	19.8644	19.4773	19.1244	(90)
Living area fraction									fLA = Living area / (4) =			0.4617	(91)
MIT	19.5707	19.7959	20.0439	20.3027	20.4299	20.4699	20.4735	20.4741	20.4585	20.2894	19.8905	19.5376	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5707	19.7959	20.0439	20.3027	20.4299	20.4699	20.4735	20.4741	20.4585	20.2894	19.8905	19.5376	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9774	0.9437	0.8511	0.6896	0.4842	0.3333	0.3680	0.5977	0.8848	0.9796	0.9944	(94)
Useful gains	460.1422	552.2002	596.9563	592.5889	500.4088	345.0645	228.9275	240.1610	370.4555	481.6679	462.0542	434.9548	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	931.6753	906.3858	821.9569	683.4655	522.0373	347.1800	229.1018	240.4784	377.6789	579.4182	768.4883	926.0674	(97)
Space heating kWh													
	350.8206	238.0127	167.4005	65.4311	16.0916	0.0000	0.0000	0.0000	0.0000	72.7262	220.6325	365.3877	(98a)
Space heating requirement - total per year (kWh/year)												1496.5030	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	350.8206	238.0127	167.4005	65.4311	16.0916	0.0000	0.0000	0.0000	0.0000	72.7262	220.6325	365.3877	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1496.5030	
Space heating per m2											(98c) / (4) =	27.1598	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	555.9753	437.6827	448.5934	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9658	0.9870	0.9812	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	536.9792	431.9827	440.1692	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	803.5683	774.9755	736.4425	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	191.9441	255.1866	220.4273	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	47.9860	63.7967	55.1068	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												166.8895	(107)
Energy for space heating												27.1598	(99)
Energy for space cooling												3.0288	(108)
Total												30.1886	(109)
Fabric Energy Efficiency (TFEE)												30.2	(109)

Full SAP Calculation Printout

Plot Reference	P-37	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-37
Plot Address	Flat 9, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.71	**TER**	13.28
Environmental	96 A	**% DER < TER**			57.00
CO_2 Emissions (t/year)	0.26	**DFEE**	30.81	**TFEE**	30.19
Compliance Check	See BREL	**% DFEE < TFEE**			-2.05
% DPER < TPER	16.53	**DPER**	58.90	**TPER**	70.57

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000 (1b)	x	2.5500 (2b)	=	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.7200	(17)
Infiltration rate			0.1360	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1156	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1474	0.1445	0.1416	0.1272	0.1243	0.1098	0.1098	0.1069	0.1156	0.1243	0.1300	0.1358	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2000	3.1860	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
Total net area of external elements Aum(A, m2)			82.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4551			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.1800			70.0000	3792.6000	(32d)
Party Ceiling 1			54.1800			30.0000	1625.4000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16516.7201	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	299.7590	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	48.3400	0.0380	1.8369
E16 Corner (normal)	14.4400	0.0540	0.7798
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.1200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1479 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.6030 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	(39)
Average = Sum(39)m / 12 =												59.7863	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	(40)
HLP (average)												1.0851	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)
Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)											Total = Sum(45)m =	1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
											Total per year (kWh/year) = Sum(64)m =	2032.8510	(64)
12Total per year (kWh/year)												2033	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9252	89.5958	80.9252	83.6227	80.9252	83.6227	80.9252	80.9252	83.6227	80.9252	83.6227	80.9252	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains	371.4998	379.7838	362.9654	348.0681	328.7897	315.3442	302.1606	303.3100	313.5027	325.8913	348.1680	363.3129	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5000	36.7938	0.3300	0.0000	0.7700	60.7705	(77)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Southwest	2.7200	36.7938	0.3300	0.0000	0.7700	25.4301	(79)

Solar gains	137.1544	233.6247	319.6555	396.0687	443.6299	440.4219	424.6137	389.1308	346.1193	258.2051	164.2794	117.3756	(83)
Total gains	508.6542	613.4085	682.6209	744.1368	772.4197	755.7660	726.7742	692.4409	659.6221	584.0963	512.4474	480.6885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	
alpha	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	
util living area	0.9920	0.9760	0.9397	0.8470	0.6899	0.5024	0.3615	0.3963	0.6116	0.8849	0.9794	0.9942	(86)
MIT	20.1613	20.3820	20.6171	20.8419	20.9608	20.9950	20.9994	20.9990	20.9846	20.8218	20.4410	20.1058	(87)
Th 2	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	(88)
util rest of house	0.9891	0.9679	0.9208	0.8064	0.6273	0.4268	0.2807	0.3118	0.5304	0.8430	0.9710	0.9921	(89)
MIT 2	19.0622	19.3378	19.6222	19.8729	19.9858	20.0108	20.0129	20.0128	20.0051	19.8597	19.4150	18.9920	(90)
Living area fraction										fLA = Living area / (4) =		0.4617	(91)
MIT	19.5696	19.8199	20.0816	20.3203	20.4360	20.4652	20.4684	20.4681	20.4573	20.3039	19.8887	19.5063	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5696	19.8199	20.0816	20.3203	20.4360	20.4652	20.4684	20.4681	20.4573	20.3039	19.8887	19.5063	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9874	0.9660	0.9223	0.8199	0.6549	0.4617	0.3180	0.3509	0.5677	0.8565	0.9697	0.9906	(94)
Useful gains	502.2574	592.5571	629.5634	610.1460	505.8271	348.9358	231.1340	242.9563	374.4391	500.3067	496.9241	476.1938	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	912.9157	892.0072	811.9917	682.7778	522.2920	350.6585	231.2774	243.2189	380.0810	580.1595	764.5897	915.1046	(97)
Space heating kWh	305.5298	201.2305	135.7266	52.2949	12.2499	0.0000	0.0000	0.0000	0.0000	59.4105	192.7193	326.5496	(98a)
Space heating requirement - total per year (kWh/year)												1285.7112	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	305.5298	201.2305	135.7266	52.2949	12.2499	0.0000	0.0000	0.0000	0.0000	59.4105	192.7193	326.5496	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1285.7112	
Space heating per m2											(98c) / (4) =	23.3341	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	305.5298	201.2305	135.7266	52.2949	12.2499	0.0000	0.0000	0.0000	0.0000	59.4105	192.7193	326.5496	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	305.5298	201.2305	135.7266	52.2949	12.2499	0.0000	0.0000	0.0000	0.0000	59.4105	192.7193	326.5496	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1285.7112	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.6545	(230a)
Total electricity for the above, kWh/year	35.6545	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2080.7138	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1285.7112	0.1573	202.2676	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			290.6744	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			314.8061	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1285.7112	1.5824	2034.4609	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			2987.7822	(279)
Pumps, fans and electric keep-hot	35.6545	1.5128	53.9382	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			3245.6132	(286)
Dwelling Primary energy Rate (DPER)			58.9000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1423	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3923	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3335	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4252	0.4169	0.4085	0.3668	0.3585	0.3168	0.3168	0.3085	0.3335	0.3585	0.3752	0.3919	(22b)
Effective ac	0.5904	0.5869	0.5834	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.6300	1.1450	13.3168			(27)
Brickwork	54.4500	11.6300	42.8200	0.1800	7.7076			(29a)
Communal Wall	18.0800	2.1500	15.9300	0.1800	2.8674			(29a)
Stairwell Wall	9.6100		9.6100	0.1800	1.7298			(29a)
Total net area of external elements Aum(A, m2)			82.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.7716			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 299.7590 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	48.3400	0.0700	3.3838
E16 Corner (normal)	14.4400	0.0900	1.2996
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0900	-0.7776
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0500	1.1700
E18 Party wall between dwellings	5.7600	0.0600	0.3456
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.1200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8644 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 33.6360 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3748	27.2120	27.0525	26.3032	26.1630	25.5103	25.5103	25.3895	25.7617	26.1630	26.4466	26.7431	(38)
Heat transfer coeff	61.0108	60.8480	60.6885	59.9392	59.7990	59.1463	59.1463	59.0254	59.3977	59.7990	60.0826	60.3791	(39)

Average = Sum(39)m / 12 = 59.9385

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1073	1.1043	1.1014	1.0878	1.0853	1.0734	1.0734	1.0712	1.0780	1.0853	1.0904	1.0958	(40)
HLP (average)												1.0878	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.5439	198.6677	211.1098	185.5406	179.8522	162.0402	159.8182	166.1156	167.9022	187.2699	199.2117	222.0653	(62)
WWHRS -25.1780	-22.2677	-23.3174	-19.3077	-17.9941	-15.3977	-14.4329	-15.3479	-15.9311	-18.7810	-21.2765	-24.7118	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
									Total per year (kWh/year) = Sum(64)m =		2030.1935	(64)

12Total per year (kWh/year) 2030 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

96.4440	85.7321	91.9771	82.7727	81.5840	74.9588	74.9227	77.0166	76.9079	84.0504	87.3183	95.6198	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.1190	89.8104	81.1190	83.8230	81.1190	83.8230	81.1190	81.1190	83.8230	81.1190	83.8230	81.1190	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	129.6290	127.5775	123.6252	114.9621	109.6559	104.1094	100.7025	103.5169	106.8166	112.9709	121.2755	128.5213	(72)

Total internal gains

	424.7956	433.1004	416.2613	401.3704	382.0856	365.6465	352.4564	353.6059	363.8050	379.1871	401.4703	416.6088 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.4700	36.7938	0.6300	0.7000	0.7700	106.4871	(77)
Southwest	2.1600	36.7938	0.6300	0.7000	0.7700	24.2885	(79)

Solar gains	130.7756	222.7592	304.7888	377.6481	422.9973	419.9384	404.8655	371.0329	330.0218	246.1963	156.6390	111.9166 (83)
Total gains	555.5712	655.8596	721.0500	779.0185	805.0829	785.5849	757.3219	724.6388	693.8268	625.3834	558.1093	528.5254 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.1994	75.4006	75.5988	76.5439	76.7234	77.5700	77.5700	77.7288	77.2417	76.7234	76.3612	75.9862	
alpha	6.0133	6.0267	6.0399	6.1029	6.1149	6.1713	6.1713	6.1819	6.1494	6.1149	6.0907	6.0657	
util living area	0.9880	0.9687	0.9281	0.8267	0.6668	0.4791	0.3433	0.3742	0.5810	0.8570	0.9698	0.9907	(86)
MIT	20.2046	20.4170	20.6429	20.8621	20.9672	20.9963	20.9996	20.9993	20.9885	20.8541	20.5013	20.1680	(87)
Th 2	19.9949	19.9973	19.9997	20.0108	20.0129	20.0226	20.0226	20.0244	20.0188	20.0129	20.0087	20.0043	(88)
util rest of house	0.9837	0.9586	0.9065	0.7839	0.6047	0.4073	0.2672	0.2951	0.5029	0.8104	0.9582	0.9874	(89)
MIT 2	19.1023	19.3673	19.6397	19.8904	19.9904	20.0209	20.0225	20.0242	20.0130	19.8907	19.4843	19.0636	(90)
Living area fraction										fLA = Living area / (4) =		0.4617	(91)
MIT	19.6112	19.8520	20.1029	20.3390	20.4414	20.4713	20.4736	20.4744	20.4634	20.3355	19.9538	19.5735	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6112	19.8520	20.1029	20.3390	20.4414	20.4713	20.4736	20.4744	20.4634	20.3355	19.9538	19.5735	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9817	0.9568	0.9090	0.7990	0.6323	0.4404	0.3024	0.3316	0.5388	0.8269	0.9574	0.9856	(94)
Useful gains	545.4107	627.5527	655.4446	622.4079	509.0229	346.0031	229.0110	240.3193	373.8111	517.1272	534.3255	520.9097	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	934.1512	909.7982	825.5379	685.6462	522.7278	347.2637	229.1109	240.4951	377.9723	582.1737	772.2907	928.2372	(97)
Space heating kWh	289.2230	189.6690	126.5494	45.5316	10.1964	0.0000	0.0000	0.0000	0.0000	48.3946	171.3350	303.0517	(98a)
Space heating requirement - total per year (kWh/year)												1183.9505	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	289.2230	189.6690	126.5494	45.5316	10.1964	0.0000	0.0000	0.0000	0.0000	48.3946	171.3350	303.0517	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1183.9505	
Space heating per m2										(98c) / (4) =		21.4873	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	289.2230	189.6690	126.5494	45.5316	10.1964	0.0000	0.0000	0.0000	0.0000	48.3946	171.3350	303.0517	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	313.3510	205.4918	137.1066	49.3300	11.0470	0.0000	0.0000	0.0000	0.0000	52.4319	185.6283	328.3333	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8932	84.2227	83.1946	81.5777	80.2822	79.8000	79.8000	79.8000	79.8000	81.6464	83.9751	85.0184	(217)
Fuel for water heating, kWh/month	234.8431	209.4446	225.7268	203.7724	201.6114	183.7625	182.1872	188.9319	190.4401	206.3641	211.8904	232.1304	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8549	13.5217	12.1747	8.9197	6.8899	5.6291	6.2852	8.1697	10.6116	13.9230	15.7260	17.3234	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.8812	-22.1119	-33.4855	-39.7436	-44.7182	-42.4426	-41.9424	-38.6757	-33.2316	-26.2086	-16.7630	-12.7382	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.2881	-11.3757	-23.0800	-35.3581	-47.4275	-47.8846	-47.3043	-39.7286	-28.7089	-16.4757	-7.1278	-4.1621	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1282.7200	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2471.1049	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	136.0290	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-680.8639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3294.9899	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1282.7200	0.2100	269.3712	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2471.1049	0.2100	518.9320	(264)
Space and water heating			788.3032	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.0290	0.1443	19.6332	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9425	0.1335	-48.9795	
PV Unit electricity exported	-313.9214	0.1253	-39.3435	
Total			-88.3230	(269)
Total CO2, kg/year			731.5427	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1282.7200	1.1300	1449.4736	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2471.1049	1.1300	2792.3485	(278)
Space and water heating			4241.8221	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.0290	1.5338	208.6458	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9425	1.4933	-547.9393	
PV Unit electricity exported	-313.9214	0.4600	-144.4093	
Total			-692.3487	(283)
Total Primary energy kWh/year			3888.2200	(286)
Target Primary Energy Rate (TPER)			70.5700	(287)

Full SAP Calculation Printout

Plot Reference	P-37	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-37
Plot Address	Flat 9, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.71	**TER**	13.28
Environmental	96 A	**% DER < TER**			57.00
CO_2 Emissions (t/year)	0.26	**DFEE**	30.81	**TFEE**	30.19
Compliance Check	See BREL	**% DFEE < TFEE**			-2.05
% DPER < TPER	16.53	**DPER**	58.90	**TPER**	70.57

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7200 (17)
Infiltration rate		0.1360 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1156 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1474	0.1445	0.1416	0.1272	0.1243	0.1098	0.1098	0.1069	0.1156	0.1243	0.1300	0.1358	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2000	3.1860	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
Total net area of external elements Aum(A, m2)			82.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4551			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.1800			70.0000	3792.6000	(32d)
Party Ceiling 1			54.1800			30.0000	1625.4000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16516.7201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		299.7590 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	48.3400	0.0380	1.8369
E16 Corner (normal)	14.4400	0.0540	0.7798
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.1200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1479 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.6030 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	(39)
Average = Sum(39)m / 12 =												59.7863	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	(40)
HLP (average)												1.0851	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)
Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)											Total = Sum(45)m =	1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
										Total per year (kWh/year) = Sum(64)m =		2032.8510	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5000	36.7938	0.3300	0.0000	0.7700	60.7705	(77)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Southwest	2.7200	36.7938	0.3300	0.0000	0.7700	25.4301	(79)

Solar gains	137.1544	233.6247	319.6555	396.0687	443.6299	440.4219	424.6137	389.1308	346.1193	258.2051	164.2794	117.3756	(83)

Total gains	559.6544	654.4542	727.1496	778.2666	801.0956	775.3271	746.0691	713.0196	682.6910	617.5640	551.3690	528.7250	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	
alpha	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	
util living area													
	0.9870	0.9677	0.9229	0.8262	0.6695	0.4902	0.3522	0.3850	0.5930	0.8624	0.9711	0.9905	(86)
MIT	20.2425	20.4408	20.6675	20.8634	20.9666	20.9956	20.9995	20.9992	20.9869	20.8485	20.4979	20.1836	(87)
Th 2	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	(88)
util rest of house													
	0.9825	0.9574	0.9005	0.7834	0.6073	0.4162	0.2734	0.3028	0.5133	0.8166	0.9599	0.9872	(89)
MIT 2	19.1641	19.4094	19.6793	19.8939	19.9901	20.0111	20.0129	20.0128	20.0064	19.8856	19.4840	19.0902	(90)
Living area fraction									fLA = Living area / (4) =			0.4617	(91)
MIT	19.6620	19.8856	20.1356	20.3415	20.4409	20.4656	20.4684	20.4682	20.4591	20.3302	19.9521	19.5951	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6620	19.8856	20.1356	20.3415	20.4409	20.4656	20.4684	20.4682	20.4591	20.3302	19.9521	19.5951	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9558	0.9036	0.7985	0.6349	0.4504	0.3098	0.3408	0.5499	0.8325	0.9590	0.9854	(94)
Useful gains	548.7662	625.5183	657.0231	621.4398	508.5946	349.1797	231.1565	243.0013	375.4170	514.1389	528.7836	520.9940	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	918.4380	895.9334	815.2203	684.0468	522.5886	350.6850	231.2801	243.2243	380.1862	581.7320	768.3809	920.4135	(97)
Space heating kWh													
	275.0358	181.7190	117.6987	45.0770	10.4115	0.0000	0.0000	0.0000	0.0000	50.2892	172.5100	297.1682	(98a)
Space heating requirement - total per year (kWh/year)												1149.9095	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	275.0358	181.7190	117.6987	45.0770	10.4115	0.0000	0.0000	0.0000	0.0000	50.2892	172.5100	297.1682	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1149.9095	
Space heating per m2											(98c) / (4) =	20.8695	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	275.0358	181.7190	117.6987	45.0770	10.4115	0.0000	0.0000	0.0000	0.0000	50.2892	172.5100	297.1682	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	275.0358	181.7190	117.6987	45.0770	10.4115	0.0000	0.0000	0.0000	0.0000	50.2892	172.5100	297.1682	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1149.9095	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.6545	(230a)
Total electricity for the above, kWh/year	35.6545	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1944.9120	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1149.9095	16.4900	189.6201	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	16.4900	103.2963	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	35.6545	16.4900	5.8794	(249)
Energy for lighting	132.9302	16.4900	21.9202	(250)
Additional standing charges			0.0000	(251)
Total energy cost			320.7160	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1534	(257)
SAP value		81.3030	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1149.9095	0.1575	181.0609	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			269.4677	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			293.5994	(272)
CO2 emissions per m2			5.3300	(273)
EI value			96.0697	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b) x	2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7200	(17)
Infiltration rate		0.1360	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1156 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate													
	0.1243	0.1185	0.1185	0.1098	0.1127	0.0983	0.0983	0.0954	0.0983	0.1098	0.1069	0.1156	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2000	3.1860	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
Total net area of external elements Aum(A, m2)			82.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4551			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.1800			70.0000	3792.6000	(32d)
Party Ceiling 1			54.1800			30.0000	1625.4000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16516.7201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 299.7590 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	48.3400	0.0380	1.8369
E16 Corner (normal)	14.4400	0.0540	0.7798
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.1200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1479 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.6030 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff													
	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	(39)

Average = Sum(39)m / 12 = 59.7863

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	(40)
HLP (average)												1.0851	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)
Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m													
	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
									Total per year (kWh/year) = Sum(64)m =		2032.8510	(64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)

Water heating gains (Table 5)

	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)

Total internal gains

	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5000	43.0593	0.3300	0.0000	0.7700	71.1189	(77)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
Southwest	2.7200	43.0593	0.3300	0.0000	0.7700	29.7605	(79)

Solar gains	160.5098	238.8325	325.0061	411.1187	451.3350	475.3292	453.1808	423.6543	375.8272	283.3976	189.3526	138.1945	(83)
Total gains	583.0098	659.6619	732.5001	793.3166	808.8006	810.2345	774.6362	747.5431	712.3989	642.7565	576.4422	549.5439	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	
alpha	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	
util living area	0.9799	0.9581	0.9001	0.7727	0.5880	0.3830	0.2546	0.2719	0.4997	0.8012	0.9528	0.9849	(86)
MIT	20.3558	20.5199	20.7389	20.9140	20.9853	20.9991	20.9999	20.9999	20.9954	20.9100	20.6128	20.3048	(87)
Th 2	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	(88)
util rest of house	0.9729	0.9447	0.8716	0.7219	0.5209	0.3107	0.1785	0.1930	0.4195	0.7430	0.9350	0.9795	(89)
MIT 2	19.3062	19.5062	19.7611	19.9435	20.0044	20.0128	20.0131	20.0130	20.0112	19.9447	19.6224	19.2430	(90)
Living area fraction									fLA = Living area / (4) =			0.4617	(91)
MIT	19.7908	19.9742	20.2126	20.3916	20.4573	20.4681	20.4687	20.4687	20.4656	20.3904	20.0797	19.7332	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7908	19.9742	20.2126	20.3916	20.4573	20.4681	20.4687	20.4687	20.4656	20.3904	20.0797	19.7332	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9710	0.9440	0.8779	0.7422	0.5515	0.3441	0.2137	0.2294	0.4566	0.7666	0.9364	0.9775	(94)
Useful gains	566.1054	622.7510	643.0953	588.8060	446.0643	278.8210	165.5204	171.4922	325.2569	492.7090	539.7601	537.1989	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	878.3085	853.4047	766.0154	627.2526	451.8205	279.0913	165.5307	171.5084	326.7677	531.5227	722.1997	874.8674	(97)
Space heating kWh	232.2791	154.9993	91.4526	27.6815	4.2826	0.0000	0.0000	0.0000	0.0000	28.8774	131.3565	251.2254	(98a)
Space heating requirement - total per year (kWh/year)												922.1545	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	232.2791	154.9993	91.4526	27.6815	4.2826	0.0000	0.0000	0.0000	0.0000	28.8774	131.3565	251.2254	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												922.1545	
Space heating per m2											(98c) / (4) =	16.7360	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	232.2791	154.9993	91.4526	27.6815	4.2826	0.0000	0.0000	0.0000	0.0000	28.8774	131.3565	251.2254	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	232.2791	154.9993	91.4526	27.6815	4.2826	0.0000	0.0000	0.0000	0.0000	28.8774	131.3565	251.2254	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement												
	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218 (64)
Efficiency of water heater												324.5200 (216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200 (217)
Fuel for water heating, kWh/month												
	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282 (231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	922.1545 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	626.4178 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)	
mechanical ventilation fans (SFP = 0.2080)	35.6545 (230a)
Total electricity for the above, kWh/year	35.6545 (231)
Electricity for lighting (calculated in Appendix L)	132.9302 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1717.1571 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	922.1545	27.6700	255.1601	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	27.6700	173.3298	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	35.6545	27.6700	9.8656	(249)
Energy for lighting	132.9302	27.6700	36.7818	(250)
Additional standing charges			0.0000	(251)
Total energy cost			475.1374	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	922.1545	0.1582	145.8893	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			234.2961	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			258.4278	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	922.1545	1.5856	1462.1943	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			2415.5156	(279)
Pumps, fans and electric keep-hot	35.6545	1.5128	53.9382	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			2673.3467	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£475	£475	£0
Space heating	£265	£265	£0
Water heating	£173	£173	£0
Lighting	£37	£37	£0
Total cost of fuels	£475	£475	£0
Total cost of uses	£475	£475	£0
Delivered energy	31 kWh/m²	31 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	49 kWh/m²	49 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7200 (17)
Infiltration rate		0.1360 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1156 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1474	0.1445	0.1416	0.1272	0.1243	0.1098	0.1098	0.1069	0.1156	0.1243	0.1300	0.1358	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2000	3.1860	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
Total net area of external elements Aum(A, m2)			82.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4551			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.1800			70.0000	3792.6000	(32d)
Party Ceiling 1			54.1800			30.0000	1625.4000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16516.7201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		299.7590 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	48.3400	0.0380	1.8369
E16 Corner (normal)	14.4400	0.0540	0.7798
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.1200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.1479 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.6030 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	(39)
Average = Sum(39)m / 12 =												59.7863	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	(40)
HLP (average)												1.0851	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.8403 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day)	103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
										Total per year (kWh/year) = Sum(64)m =		2032.8510	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)

Water heating gains (Table 5)

	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192 (72)
Total internal gains												
	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5000	36.7938	0.3300	0.0000	0.7700	60.7705	(77)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
Southwest	2.7200	36.7938	0.3300	0.0000	0.7700	25.4301	(79)

Solar gains	137.1544	233.6247	319.6555	396.0687	443.6299	440.4219	424.6137	389.1308	346.1193	258.2051	164.2794	117.3756	(83)
Total gains	559.6544	654.4542	727.1496	778.2666	801.0956	775.3271	746.0691	713.0196	682.6910	617.5640	551.3690	528.7250	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	
alpha	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	
util living area													
	0.9870	0.9677	0.9229	0.8262	0.6695	0.4902	0.3522	0.3850	0.5930	0.8624	0.9711	0.9905	(86)
MIT	20.2425	20.4408	20.6675	20.8634	20.9666	20.9956	20.9995	20.9992	20.9869	20.8485	20.4979	20.1836	(87)
Th 2	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	(88)
util rest of house													
	0.9825	0.9574	0.9005	0.7834	0.6073	0.4162	0.2734	0.3028	0.5133	0.8166	0.9599	0.9872	(89)
MIT 2	19.1641	19.4094	19.6793	19.8939	19.9901	20.0111	20.0129	20.0128	20.0064	19.8856	19.4840	19.0902	(90)
Living area fraction										fLA = Living area / (4) =		0.4617	(91)
MIT	19.6620	19.8856	20.1356	20.3415	20.4409	20.4656	20.4684	20.4682	20.4591	20.3302	19.9521	19.5951	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6620	19.8856	20.1356	20.3415	20.4409	20.4656	20.4684	20.4682	20.4591	20.3302	19.9521	19.5951	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9558	0.9036	0.7985	0.6349	0.4504	0.3098	0.3408	0.5499	0.8325	0.9590	0.9854	(94)
Useful gains	548.7662	625.5183	657.0231	621.4398	508.5946	349.1797	231.1565	243.0013	375.4170	514.1389	528.7836	520.9940	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	918.4380	895.9334	815.2203	684.0468	522.5886	350.6850	231.2801	243.2243	380.1862	581.7320	768.3809	920.4135	(97)
Space heating kWh													
	275.0358	181.7190	117.6987	45.0770	10.4115	0.0000	0.0000	0.0000	0.0000	50.2892	172.5100	297.1682	(98a)
Space heating requirement - total per year (kWh/year)												1149.9095	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	275.0358	181.7190	117.6987	45.0770	10.4115	0.0000	0.0000	0.0000	0.0000	50.2892	172.5100	297.1682	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1149.9095	
Space heating per m2											(98c) / (4) =	20.8695	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	275.0358	181.7190	117.6987	45.0770	10.4115	0.0000	0.0000	0.0000	0.0000	50.2892	172.5100	297.1682	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	275.0358	181.7190	117.6987	45.0770	10.4115	0.0000	0.0000	0.0000	0.0000	50.2892	172.5100	297.1682	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1149.9095	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	626.4178	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.6545	(230a)
Total electricity for the above, kWh/year	35.6545	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1944.9120	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1149.9095	16.4900	189.6201	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	16.4900	103.2963	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	35.6545	16.4900	5.8794	(249)
Energy for lighting	132.9302	16.4900	21.9202	(250)
Additional standing charges			0.0000	(251)
Total energy cost			320.7160	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1534	(257)
SAP value		81.3030	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1149.9095	0.1575	181.0609	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			269.4677	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			293.5994	(272)
CO2 emissions per m2			5.3300	(273)
EI value			96.0697	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.7200 (17)
Infiltration rate			0.1360 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1156 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1243	0.1185	0.1185	0.1098	0.1127	0.0983	0.0983	0.0954	0.0983	0.1098	0.1069	0.1156	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Flat Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2000	3.1860	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
Total net area of external elements Aum(A, m2)			82.1400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.4551			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.1800			70.0000	3792.6000	(32d)
Party Ceiling 1			54.1800			30.0000	1625.4000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16516.7201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		299.7590 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	48.3400	0.0380	1.8369
E16 Corner (normal)	14.4400	0.0540	0.7798
E17 Corner (inverted - internal area greater than external area)	8.6400	-0.0970	-0.8381
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	5.7600	0.0380	0.2189
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.1200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.1479 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.6030 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	59.7863	(39)
Average = Sum(39)m / 12 =												59.7863	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	1.0851	(40)
HLP (average)												1.0851	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.8403 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)
Hot water usage for baths	23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)
Hot water usage for other uses	33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)
Average daily hot water use (litres/day)												103.2837	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)

Water storage loss (or HIU loss):	
Store volume	200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)

If cylinder contains dedicated solar storage

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218 (64)

Total per year (kWh/year) = Sum(64)m = 2032.8510 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116 (71)

Water heating gains (Table 5)

	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192 (72)

Total internal gains

	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5000	43.0593	0.3300	0.0000	0.7700	71.1189	(77)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
Southwest	2.7200	43.0593	0.3300	0.0000	0.7700	29.7605	(79)

Solar gains	160.5098	238.8325	325.0061	411.1187	451.3350	475.3292	453.1808	423.6543	375.8272	283.3976	189.3526	138.1945	(83)
Total gains	583.0098	659.6619	732.5001	793.3166	808.8006	810.2345	774.6362	747.5431	712.3989	642.7565	576.4422	549.5439	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	76.7396	
alpha	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	6.1160	
util living area	0.9799	0.9581	0.9001	0.7727	0.5880	0.3830	0.2546	0.2719	0.4997	0.8012	0.9528	0.9849	(86)
MIT	20.3558	20.5199	20.7389	20.9140	20.9853	20.9991	20.9999	20.9999	20.9954	20.9100	20.6128	20.3048	(87)
Th 2	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	20.0131	(88)
util rest of house	0.9729	0.9447	0.8716	0.7219	0.5209	0.3107	0.1785	0.1930	0.4195	0.7430	0.9350	0.9795	(89)
MIT 2	19.3062	19.5062	19.7611	19.9435	20.0044	20.0128	20.0131	20.0130	20.0112	19.9447	19.6224	19.2430	(90)

Living area fraction fLA = Living area / (4) = 0.4617 (91)

MIT	19.7908	19.9742	20.2126	20.3916	20.4573	20.4681	20.4687	20.4687	20.4656	20.3904	20.0797	19.7332	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7908	19.9742	20.2126	20.3916	20.4573	20.4681	20.4687	20.4687	20.4656	20.3904	20.0797	19.7332	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9710	0.9440	0.8779	0.7422	0.5515	0.3441	0.2137	0.2294	0.4566	0.7666	0.9364	0.9775	(94)
Useful gains	566.1054	622.7510	643.0953	588.8060	446.0643	278.8210	165.5204	171.4922	325.2569	492.7090	539.7601	537.1989	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	878.3085	853.4047	766.0154	627.2526	451.8205	279.0913	165.5307	171.5084	326.7677	531.5227	722.1997	874.8674	(97)
Space heating kWh	232.2791	154.9993	91.4526	27.6815	4.2826	0.0000	0.0000	0.0000	0.0000	28.8774	131.3565	251.2254	(98a)

Space heating requirement - total per year (kWh/year) 922.1545

Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh	232.2791	154.9993	91.4526	27.6815	4.2826	0.0000	0.0000	0.0000	0.0000	28.8774	131.3565	251.2254	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 922.1545
Space heating per m2 (98c) / (4) = 16.7360 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	232.2791	154.9993	91.4526	27.6815	4.2826	0.0000	0.0000	0.0000	0.0000	28.8774	131.3565	251.2254	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	232.2791	154.9993	91.4526	27.6815	4.2826	0.0000	0.0000	0.0000	0.0000	28.8774	131.3565	251.2254	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	922.1545	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	626.4178	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.6545	(230a)
Total electricity for the above, kWh/year	35.6545	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1717.1571	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	922.1545	27.6700	255.1601	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	27.6700	173.3298	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	35.6545	27.6700	9.8656	(249)
Energy for lighting	132.9302	27.6700	36.7818	(250)
Additional standing charges			0.0000	(251)
Total energy cost			475.1374	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	922.1545	0.1582	145.8893	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			234.2961	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			258.4278	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	922.1545	1.5856	1462.1943	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			2415.5156	(279)
Pumps, fans and electric keep-hot	35.6545	1.5128	53.9382	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			2673.3467	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-38	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-38
Plot Address	Flat 5, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	79 C	**DER**	5.41	**TER**	11.03
Environmental	95 A	**% DER < TER**			50.95
CO_2 Emissions (t/year)	0.4	**DFEE**	31.14	**TFEE**	30.90
Compliance Check	See BREL	**% DFEE < TFEE**			-0.80
% DPER < TPER	4.38	**DPER**	55.56	**TPER**	58.11

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	34.73 m	88.53 m²	2.55 m

8.0 Living Area	30.81	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	63.75	39.01	0.00	None	24.74	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	20.49	18.43	0.90	Stairwell Access Corridor 4	2.06	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	15.92	15.92	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	25.80	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	192.24

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	88.53

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	88.53

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Patio Door	Brickwork	South East	2.46	
SE	Window	Brickwork	South East	5.42	
East	Window	Brickwork	East	16.86	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Gov Approved Scheme	61.34	0.04	0.04	RCD	No
E16 Corner (normal)	Gov Approved Scheme	11.58	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.76	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	2.88	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	17.92	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	11.33	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	37.80	0.02	0.02	RCD	Yes
E20 Exposed floor (normal)	Table K1 - Default	3.22	0.32	0.32	-	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.90	0.33	0.33	AbbeyCalculated	No
E25 Staggered party wall between dwellings	Gov Approved Scheme	2.88	0.03	0.03		No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No
22.0 Pressure Testing	Yes

Summary for Input Data

elmhurst energy

Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.53	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	10
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day
34.0 Small-scale Hydro	None	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-38	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-38
Plot Address	Flat 5, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	79 C	**DER**	5.41	**TER**	11.03
Environmental	95 A	**% DER < TER**			50.95
CO_2 Emissions (t/year)	0.4	**DFEE**	31.14	**TFEE**	30.90
Compliance Check	See BREL	**% DFEE < TFEE**			-0.80
% DPER < TPER	4.38	**DPER**	55.56	**TPER**	58.11

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.5300 (17)
Infiltration rate			0.1265 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1075 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1371	0.1344	0.1317	0.1183	0.1156	0.1021	0.1021	0.0995	0.1075	0.1156	0.1210	0.1263	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.7500	24.7400	39.0100	0.2100	8.1921	110.0000	4291.1000	(29a)
Communal Wall	20.4900	2.0600	18.4300	0.2000	3.6860	110.0000	2027.3000	(29a)
Stairwell Wall	15.9200		15.9200	0.1600	2.5472	110.0000	1751.2000	(29a)
Total net area of external elements Aum(A, m2)			100.1600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.2255			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21490.7599 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.7512 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	11.5800	0.0540	0.6253
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E20 Exposed floor (normal)	3.2200	0.3200	1.0304
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4149 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.6405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	(39)
Average = Sum(39)m / 12 =												88.8895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	(40)
HLP (average)												1.0041	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)
Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
										Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
12Total per year (kWh/year)												2432	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2100	131.9825	119.2100	123.1837	119.2100	123.1837	119.2100	119.2100	123.1837	119.2100	123.1837	119.2100	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains	515.6824	528.3777	504.5516	484.6874	457.5630	439.0886	420.4867	421.5043	435.7267	452.4980	483.3190	503.8885	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	673.4964	818.4677	947.3248	1092.7755	1180.3625	1171.6370	1120.7570	1036.1294	936.9106	786.5029	676.4761	636.1307	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	
alpha	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	
util living area													
	0.9928	0.9794	0.9432	0.8388	0.6672	0.4807	0.3483	0.3932	0.6309	0.9051	0.9830	0.9946	(86)
MIT	19.9607	20.1980	20.4963	20.7975	20.9502	20.9928	20.9990	20.9981	20.9717	20.7292	20.2731	19.9036	(87)
Th 2	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	(88)
util rest of house													
	0.9906	0.9735	0.9279	0.8028	0.6114	0.4138	0.2758	0.3153	0.5561	0.8732	0.9771	0.9930	(89)
MIT 2	18.8776	19.1767	19.5437	19.8895	20.0419	20.0761	20.0796	20.0793	20.0626	19.8251	19.2743	18.8051	(90)
Living area fraction										fLA = Living area / (4) =		0.3480	(91)
MIT	19.2545	19.5322	19.8752	20.2055	20.3580	20.3952	20.3996	20.3990	20.3790	20.1398	19.6219	19.1874	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2545	19.5322	19.8752	20.2055	20.3580	20.3952	20.3996	20.3990	20.3790	20.1398	19.6219	19.1874	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9879	0.9691	0.9240	0.8081	0.6288	0.4369	0.3011	0.3424	0.5811	0.8756	0.9733	0.9908	(94)
Useful gains	665.3779	793.2070	875.3162	883.0701	742.1555	511.9087	337.4120	354.8055	544.4377	688.6432	658.4100	630.2839	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1329.3010	1300.6443	1188.9156	1004.9429	769.6065	515.1282	337.7430	355.4723	558.1376	847.9848	1113.0673	1332.2211	(97)
Space heating kWh													
	493.9588	340.9979	233.3180	87.7484	20.4236	0.0000	0.0000	0.0000	0.0000	118.5501	327.3532	522.2413	(98a)
Space heating requirement - total per year (kWh/year)												2144.5913	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	493.9588	340.9979	233.3180	87.7484	20.4236	0.0000	0.0000	0.0000	0.0000	118.5501	327.3532	522.2413	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2144.5913	
Space heating per m2											(98c) / (4) =	24.2245	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	493.9588	340.9979	233.3180	87.7484	20.4236	0.0000	0.0000	0.0000	0.0000	118.5501	327.3532	522.2413	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	493.9588	340.9979	233.3180	87.7484	20.4236	0.0000	0.0000	0.0000	0.0000	118.5501	327.3532	522.2413	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2144.5913	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	749.5372	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3147.2332	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2144.5913	0.1570	336.6950	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			442.5329	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			478.7418	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.4100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2144.5913	1.5812	3390.9899	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			4531.8884	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			4918.9039	(286)
Dwelling Primary energy Rate (DPER)			55.5600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300 (1b)	x	2.5500 (2b)	=	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	225.7515	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1329	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3829	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3255	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4150	0.4068	0.3987	0.3580	0.3499	0.3092	0.3092	0.3010	0.3255	0.3499	0.3661	0.3824	(22b)
Effective ac	0.5861	0.5828	0.5795	0.5641	0.5612	0.5478	0.5478	0.5453	0.5530	0.5612	0.5670	0.5731	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.0800	1.1450	22.9924			(27)
Brickwork	63.7500	20.0800	43.6700	0.1800	7.8606			(29a)
Communal Wall	20.4900	2.0600	18.4300	0.1800	3.3174			(29a)
Stairwell Wall	15.9200		15.9200	0.1800	2.8656			(29a)
Total net area of external elements Aum(A, m2)			100.1600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.0960			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.7512 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0700	4.2938
E16 Corner (normal)	11.5800	0.0900	1.0422
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184
E18 Party wall between dwellings	2.8800	0.0600	0.1728
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0500	1.8900
E20 Exposed floor (normal)	3.2200	0.3200	1.0304
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.0200	0.0980
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7481 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.8441 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6629	43.4138	43.1697	42.0230	41.8085	40.8098	40.8098	40.6248	41.1945	41.8085	42.2425	42.6962	(38)
Heat transfer coeff	91.5069	91.2579	91.0137	89.8671	89.6526	88.6539	88.6539	88.4689	89.0385	89.6526	90.0866	90.5403	(39)

Average = Sum(39)m / 12 = 89.8661

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0336	1.0308	1.0281	1.0151	1.0127	1.0014	1.0014	0.9993	1.0057	1.0127	1.0176	1.0227	(40)
HLP (average)												1.0151	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)
Hot water usage for baths	29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)
Hot water usage for other uses	41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)

Energy content (annual) Total = Sum(45)m = 2115.0673

Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	265.9895	235.1357	249.4246	218.2505	210.8868	189.2764	186.1876	193.9523	196.5057	220.0343	235.1073	262.9338	(62)
WWHRS	-31.0401	-27.4522	-28.7463	-23.8031	-22.1836	-18.9827	-17.7932	-18.9213	-19.6402	-23.1537	-26.2303	-30.4653	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)

Total per year (kWh/year) = Sum(64)m = 2375.2726 (64)

12Total per year (kWh/year) 2375 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	110.2246	97.8577	104.7168	93.6487	91.9030	84.0148	83.6905	86.2723	86.4186	94.9445	99.2536	109.2086	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.1862	131.9562	119.1862	123.1591	119.1862	123.1591	119.1862	119.1862	123.1591	119.1862	123.1591	119.1862	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)													
	148.1514	145.6216	140.7484	130.0677	123.5255	116.6873	112.4872	115.9573	120.0258	127.6136	137.8523	146.7858	(72)
Total internal gains													
	568.7607	581.4534	557.6299	537.7649	510.6412	489.1661	470.5649	471.5825	485.8042	505.5763	536.3964	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	13.6800	19.6403	0.6300	0.7000	0.7700	82.1117	(76)
Southeast	6.4000	36.7938	0.6300	0.7000	0.7700	71.9659	(77)

Solar gains	154.0776	283.2125	432.2570	593.6234	705.5922	715.1042	683.5967	599.9992	489.2723	326.0807	188.5823	129.1125	(83)
Total gains	722.8383	864.6659	989.8868	1131.3882	1216.2334	1204.2703	1154.1617	1071.5817	975.0764	831.6570	724.9787	686.0793	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.2372	65.4152	65.5907	66.4276	66.5866	67.3367	67.3367	67.4774	67.0457	66.5866	66.2658	65.9337	
alpha	5.3491	5.3610	5.3727	5.4285	5.4391	5.4891	5.4891	5.4985	5.4697	5.4391	5.4177	5.3956	
util living area													
	0.9903	0.9752	0.9365	0.8272	0.6552	0.4671	0.3374	0.3786	0.6105	0.8887	0.9775	0.9925	(86)
MIT	19.9710	20.2065	20.5021	20.8074	20.9531	20.9938	20.9991	20.9984	20.9756	20.7541	20.3094	19.9335	(87)
Th 2	20.0554	20.0577	20.0600	20.0708	20.0728	20.0822	20.0822	20.0839	20.0785	20.0728	20.0687	20.0645	(88)
util rest of house													
	0.9874	0.9682	0.9198	0.7899	0.5993	0.4019	0.2673	0.3038	0.5367	0.8534	0.9700	0.9902	(89)
MIT 2	18.8721	19.1696	19.5334	19.8910	20.0372	20.0789	20.0819	20.0834	20.0638	19.8451	19.3104	18.8314	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.2545	19.5305	19.8705	20.2099	20.3560	20.3973	20.4011	20.4018	20.3812	20.1615	19.6581	19.2150	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2545	19.5305	19.8705	20.2099	20.3560	20.3973	20.4011	20.4018	20.3812	20.1615	19.6581	19.2150	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9634	0.9159	0.7959	0.6168	0.4245	0.2917	0.3299	0.5615	0.8572	0.9658	0.9875	(94)
Useful gains	711.4177	832.9969	906.6612	900.4457	750.2130	511.1922	336.7065	353.4998	547.5423	712.8868	700.1855	677.4825	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1368.4434	1335.1452	1216.9021	1016.3894	776.0287	513.9535	336.9838	354.0375	559.2656	857.2086	1131.3137	1359.4585	(97)
Space heating kWh													
	488.8272	337.4437	230.8193	83.4794	19.2069	0.0000	0.0000	0.0000	0.0000	107.3754	310.4123	507.3901	(98a)
Space heating requirement - total per year (kWh/year)												2084.9543	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	488.8272	337.4437	230.8193	83.4794	19.2069	0.0000	0.0000	0.0000	0.0000	107.3754	310.4123	507.3901	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2084.9543	
Space heating per m2											(98c) / (4) =	23.5508	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	488.8272	337.4437	230.8193	83.4794	19.2069	0.0000	0.0000	0.0000	0.0000	107.3754	310.4123	507.3901	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	529.6069	365.5944	250.0750	90.4436	20.8092	0.0000	0.0000	0.0000	0.0000	116.3331	336.3080	549.7185	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6638	85.1416	84.1607	82.3056	80.5542	79.8000	79.8000	79.8000	79.8000	82.7602	84.9464	85.7609	(217)
Fuel for water heating, kWh/month													
	274.2692	243.9271	262.2106	236.2506	234.2561	213.4006	211.0205	219.3371	221.6360	237.8929	245.8928	271.0658	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.7645	19.8670	17.8881	13.1056	10.1231	8.2707	9.2346	12.0035	15.5914	20.4568	23.1059	25.4528	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4691	-34.6368	-52.0885	-61.3551	-68.5894	-64.8929	-64.0827	-59.2821	-51.2531	-40.8103	-26.3403	-20.1124	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.9372	-19.1683	-38.7962	-59.3119	-79.4625	-80.2372	-79.3113	-66.6912	-48.2676	-27.7712	-12.0453	-7.0415	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2258.8887	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2871.1594	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	199.8640	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1093.9542	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4321.9579	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2258.8887	0.2100	474.3666	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2871.1594	0.2100	602.9435	(264)
Space and water heating			1077.3101	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.8640	0.1443	28.8466	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9127	0.1336	-75.7632	
PV Unit electricity exported	-527.0415	0.1254	-66.0772	
Total			-141.8403	(269)
Total CO2, kg/year			976.2456	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2258.8887	1.1300	2552.5443	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2871.1594	1.1300	3244.4101	(278)
Space and water heating			5796.9544	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.8640	1.5338	306.5581	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9127	1.4939	-846.8903	
PV Unit electricity exported	-527.0415	0.4602	-242.5352	
Total			-1089.4255	(283)
Total Primary energy kWh/year			5144.1878	(286)
Target Primary Energy Rate (TPER)			58.1100	(287)

Full SAP Calculation Printout

Plot Reference	P-38	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-38
Plot Address	Flat 5, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	79 C	**DER**	5.41	**TER**	11.03
Environmental	95 A	**% DER < TER**			50.95
CO_2 Emissions (t/year)	0.4	**DFEE**	31.14	**TFEE**	30.90
Compliance Check	See BREL	**% DFEE < TFEE**			-0.80
% DPER < TPER	4.38	**DPER**	55.56	**TPER**	58.11

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1329	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5300	(17)
Infiltration rate		0.2594	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2205	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2811	0.2756	0.2701	0.2425	0.2370	0.2095	0.2095	0.2039	0.2205	0.2370	0.2480	0.2591	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5395	0.5380	0.5365	0.5294	0.5281	0.5219	0.5219	0.5208	0.5243	0.5281	0.5308	0.5336	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.7500	24.7400	39.0100	0.2100	8.1921	110.0000	4291.1000	(29a)
Communal Wall	20.4900	2.0600	18.4300	0.2000	3.6860	110.0000	2027.3000	(29a)
Stairwell Wall	15.9200		15.9200	0.1600	2.5472	110.0000	1751.2000	(29a)
Total net area of external elements Aum(A, m2)			100.1600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.2255			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	21490.7599 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		242.7512 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309	
E16 Corner (normal)	11.5800	0.0540	0.6253	
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587	
E18 Party wall between dwellings	2.8800	0.0380	0.1094	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665	
E4 Jamb	37.8000	0.0160	0.6048	
E20 Exposed floor (normal)	3.2200	0.3200	1.0304	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170	
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4149 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.6405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.1926	40.0783	39.9662	39.4400	39.3415	38.8832	38.8832	38.7983	39.0597	39.3415	39.5407	39.7490	(38)
Heat transfer coeff	91.8331	91.7188	91.6067	91.0805	90.9820	90.5237	90.5237	90.4388	90.7002	90.9820	91.1812	91.3894	(39)
Average = Sum(39)m / 12 =												91.0800	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0373	1.0360	1.0348	1.0288	1.0277	1.0225	1.0225	1.0216	1.0245	1.0277	1.0299	1.0323	(40)
HLP (average)												1.0288	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 64.7389 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.6300	68.6924	66.5771	63.9443	61.5955	59.1546	58.6475	60.7586	62.9237	65.4304	68.0865	70.5309	(44)
Energy conte	111.8607	97.8171	102.3265	87.5365	82.9194	72.7375	70.9291	75.2318	77.5912	88.7884	97.0017	110.4343	(45)
Energy content (annual)											Total = Sum(45)m =	1075.1741	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(64)

Total per year (kWh/year) = Sum(64)m = 913.8980 (64)
12Total per year (kWh/year) 914 (64)
Electric shower(s)

54.3750	48.4486	52.9040	50.4856	51.4330	49.0621	50.6975	51.4330	50.4856	52.9040	51.9092	54.3750	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 618.5126 (64a)
Heat gains from water heating, kWh/month

37.3642	32.8983	34.9704	31.2229	30.4786	27.7222	27.7468	28.8450	29.1095	32.0935	33.5902	37.0611	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2100	131.9825	119.2100	123.1837	119.2100	123.1837	119.2100	119.2100	123.1837	119.2100	123.1837	119.2100	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	50.2206	48.9558	47.0032	43.3652	40.9659	38.5031	37.2941	38.7702	40.4299	43.1365	46.6530	49.8132	(72)
Total internal gains	467.8537	481.8139	460.9085	448.0869	425.1054	411.0065	395.3956	394.4191	406.2329	418.1229	442.2217	457.0181	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	625.6677	771.9039	903.6817	1056.1750	1147.9049	1143.5549	1095.6659	1009.0442	907.4168	752.1278	635.3789	589.2602	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.0055	65.0865	65.1661	65.5426	65.6136	65.9458	65.9458	66.0077	65.8174	65.6136	65.4702	65.3211	
alpha	5.3337	5.3391	5.3444	5.3695	5.3742	5.3964	5.3964	5.4005	5.3878	5.3742	5.3647	5.3547	
util living area	0.9950	0.9848	0.9553	0.8604	0.6932	0.5002	0.3625	0.4103	0.6578	0.9223	0.9876	0.9963	(86)
MIT	19.8467	20.0928	20.4111	20.7548	20.9361	20.9906	20.9986	20.9974	20.9633	20.6797	20.1888	19.7985	(87)
Th 2	20.0524	20.0534	20.0545	20.0594	20.0603	20.0646	20.0646	20.0654	20.0630	20.0603	20.0585	20.0565	(88)
util rest of house	0.9935	0.9803	0.9425	0.8264	0.6362	0.4299	0.2860	0.3280	0.5806	0.8940	0.9831	0.9952	(89)
MIT 2	19.0080	19.2517	19.5606	19.8773	20.0219	20.0607	20.0643	20.0647	20.0452	19.8215	19.3525	18.9634	(90)
Living area fraction										fLA = Living area / (4) =		0.3480	(91)
MIT	19.2999	19.5444	19.8566	20.1827	20.3400	20.3843	20.3894	20.3893	20.3647	20.1202	19.6435	19.2540	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2999	19.5444	19.8566	20.1827	20.3400	20.3843	20.3894	20.3893	20.3647	20.1202	19.6435	19.2540	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9918	0.9772	0.9394	0.8312	0.6538	0.4542	0.3127	0.3567	0.6064	0.8961	0.9806	0.9939	(94)
Useful gains	620.5601	754.3239	848.8969	877.9232	750.5203	519.3995	342.5872	359.8893	550.2556	673.9789	623.0268	585.6493	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1377.4878	1343.1693	1223.5549	1027.6343	786.0890	523.6201	343.0348	360.7877	568.2131	866.1662	1143.7340	1375.7812	(97)
Space heating kWh	563.1542	395.7041	278.7456	107.7920	26.4631	0.0000	0.0000	0.0000	0.0000	142.9873	374.9092	587.8581	(98a)
Space heating requirement - total per year (kWh/year)												2477.6136	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	563.1542	395.7041	278.7456	107.7920	26.4631	0.0000	0.0000	0.0000	0.0000	142.9873	374.9092	587.8581	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2477.6136	
Space heating per m2											(98c) / (4) =	27.9861	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	850.9226	669.8752	687.3349	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9612	0.9829	0.9729	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	817.9455	658.4049	668.6776	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1289.9639	1236.3028	1137.3929	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	339.8532	429.9560	348.7241	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	84.9633	107.4890	87.1810	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												279.6334	(107)
Energy for space heating												27.9861	(99)
Energy for space cooling												3.1586	(108)
Total												31.1448	(109)
Fabric Energy Efficiency (DFEE)												31.1	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		225.7515	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												30.0000 / (5) =	0.1329 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.3829 (18)
Number of sides sheltered													2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3255 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4150	0.4068	0.3987	0.3580	0.3499	0.3092	0.3092	0.3010	0.3255	0.3499	0.3661	0.3824	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5861	0.5828	0.5795	0.5641	0.5612	0.5478	0.5478	0.5453	0.5530	0.5612	0.5670	0.5731	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.0800	1.1450	22.9924			(27)
Brickwork	63.7500	20.0800	43.6700	0.1800	7.8606			(29a)
Communal Wall	20.4900	2.0600	18.4300	0.1800	3.3174			(29a)
Stairwell Wall	15.9200		15.9200	0.1800	2.8656			(29a)
Total net area of external elements Aum(A, m2)			100.1600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.0960			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.7512 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0700	4.2938
E16 Corner (normal)	11.5800	0.0900	1.0422
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184
E18 Party wall between dwellings	2.8800	0.0600	0.1728
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0500	1.8900
E20 Exposed floor (normal)	3.2200	0.3200	1.0304
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.0200	0.0980
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7481 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.8441 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6629	43.4138	43.1697	42.0230	41.8085	40.8098	40.8098	40.6248	41.1945	41.8085	42.2425	42.6962	(38)
Heat transfer coeff	91.5069	91.2579	91.0137	89.8671	89.6526	88.6539	88.6539	88.4689	89.0385	89.6526	90.0866	90.5403	(39)
Average = Sum(39)m / 12 =												89.8661	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0336	1.0308	1.0281	1.0151	1.0127	1.0014	1.0014	0.9993	1.0057	1.0127	1.0176	1.0227	(40)
HLP (average)												1.0151	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 64.7389 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.6300	68.6924	66.5771	63.9443	61.5955	59.1546	58.6475	60.7586	62.9237	65.4304	68.0865	70.5309	(44)
Energy conte	111.8607	97.8171	102.3265	87.5365	82.9194	72.7375	70.9291	75.2318	77.5912	88.7884	97.0017	110.4343	(45)
Energy content (annual)										Total = Sum(45)m =		1075.1741	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(64)
										Total per year (kWh/year) = Sum(64)m =		913.8980	(64)
12Total per year (kWh/year)												914	(64)
Electric shower(s)													
	54.3750	48.4486	52.9040	50.4856	51.4330	49.0621	50.6975	51.4330	50.4856	52.9040	51.9092	54.3750	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		618.5126	(64a)
Heat gains from water heating, kWh/month													
	37.3642	32.8983	34.9704	31.2229	30.4786	27.7222	27.7468	28.8450	29.1095	32.0935	33.5902	37.0611	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	119.1862	131.9562	119.1862	123.1591	119.1862	123.1591	119.1862	119.1862	123.1591	119.1862	123.1591	119.1862	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)													
	50.2206	48.9558	47.0032	43.3652	40.9659	38.5031	37.2941	38.7702	40.4299	43.1365	46.6530	49.8132	(72)
Total internal gains													
	467.8299	481.7875	460.8847	448.0623	425.0816	410.9819	395.3718	394.3953	406.2083	418.0991	442.1971	456.9943	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	13.6800	19.6403	0.6300	0.7000	0.7700	82.1117	(76)
Southeast	6.4000	36.7938	0.6300	0.7000	0.7700	71.9659	(77)

Solar gains	154.0776	283.2125	432.2570	593.6234	705.5922	715.1042	683.5967	599.9992	489.2723	326.0807	188.5823	129.1125	(83)
Total gains	621.9076	765.0001	893.1416	1041.6857	1130.6738	1126.0862	1078.9685	994.3945	895.4805	744.1798	630.7794	586.1068	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.2372	65.4152	65.5907	66.4276	66.5866	67.3367	67.3367	67.4774	67.0457	66.5866	66.2658	65.9337	
alpha	5.3491	5.3610	5.3727	5.4285	5.4391	5.4891	5.4891	5.4985	5.4697	5.4391	5.4177	5.3956	
util living area													
	0.9951	0.9853	0.9567	0.8620	0.6944	0.4980	0.3607	0.4075	0.6560	0.9227	0.9878	0.9964	(86)
MIT	19.8482	20.0931	20.4101	20.7591	20.9382	20.9916	20.9988	20.9977	20.9657	20.6875	20.2006	19.8105	(87)
Th 2	20.0554	20.0577	20.0600	20.0708	20.0728	20.0822	20.0822	20.0839	20.0785	20.0728	20.0687	20.0645	(88)
util rest of house													
	0.9936	0.9809	0.9443	0.8284	0.6380	0.4292	0.2859	0.3273	0.5799	0.8947	0.9834	0.9953	(89)
MIT 2	19.0119	19.2556	19.5645	19.8916	20.0355	20.0787	20.0819	20.0833	20.0620	19.8395	19.3724	18.9816	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.3029	19.5471	19.8588	20.1935	20.3497	20.3964	20.4010	20.4015	20.3765	20.1346	19.6606	19.2701	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3029	19.5471	19.8588	20.1935	20.3497	20.3964	20.4010	20.4015	20.3765	20.1346	19.6606	19.2701	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9920	0.9779	0.9411	0.8332	0.6555	0.4530	0.3119	0.3552	0.6054	0.8968	0.9809	0.9940	(94)
Useful gains	616.9533	748.0901	840.5788	867.9773	741.1089	510.0803	336.5820	353.2320	542.1218	667.4075	618.7238	582.5906	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1372.8724	1336.6614	1215.8317	1014.9162	775.4662	513.8702	336.9719	354.0121	558.8511	854.7993	1131.5423	1364.4505	(97)
Space heating kWh													
	562.4038	395.5199	279.1882	105.7960	25.5618	0.0000	0.0000	0.0000	0.0000	139.4196	369.2293	581.7038	(98a)
Space heating requirement - total per year (kWh/year)												2458.8225	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	562.4038	395.5199	279.1882	105.7960	25.5618	0.0000	0.0000	0.0000	0.0000	139.4196	369.2293	581.7038	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2458.8225	
Space heating per m2										(98c) / (4) =		27.7739	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	833.3462	656.0385	672.3637	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9635	0.9842	0.9750	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	802.9703	645.6691	655.5238	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1269.5726	1216.8119	1120.2947	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	335.9536	424.9302	345.7895	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	83.9884	106.2326	86.4474	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												276.6684	(107)
Energy for space heating												27.7739	(99)
Energy for space cooling												3.1251	(108)
Total												30.8990	(109)
Fabric Energy Efficiency (TFEE)												30.9	(109)

Full SAP Calculation Printout

Plot Reference	P-38	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-38
Plot Address	Flat 5, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	79 C	**DER**	5.41	**TER**	11.03
Environmental	95 A	**% DER < TER**			50.95
CO_2 Emissions (t/year)	0.4	**DFEE**	31.14	**TFEE**	30.90
Compliance Check	See BREL	**% DFEE < TFEE**			-0.80
% DPER < TPER	4.38	**DPER**	55.56	**TPER**	58.11

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.5300 (17)
Infiltration rate			0.1265 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1075 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1371	0.1344	0.1317	0.1183	0.1156	0.1021	0.1021	0.0995	0.1075	0.1156	0.1210	0.1263	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.7500	24.7400	39.0100	0.2100	8.1921	110.0000	4291.1000	(29a)
Communal Wall	20.4900	2.0600	18.4300	0.2000	3.6860	110.0000	2027.3000	(29a)
Stairwell Wall	15.9200		15.9200	0.1600	2.5472	110.0000	1751.2000	(29a)
Total net area of external elements Aum(A, m2)			100.1600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.2255			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21490.7599 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.7512 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	11.5800	0.0540	0.6253
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E20 Exposed floor (normal)	3.2200	0.3200	1.0304
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4149 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.6405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	(39)
Average = Sum(39)m / 12 =												88.8895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	(40)
HLP (average)												1.0041	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)
Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
										Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
12Total per year (kWh/year)												2432	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2100	131.9825	119.2100	123.1837	119.2100	123.1837	119.2100	119.2100	123.1837	119.2100	123.1837	119.2100	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains	515.6824	528.3777	504.5516	484.6874	457.5630	439.0886	420.4867	421.5043	435.7267	452.4980	483.3190	503.8885	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	673.4964	818.4677	947.3248	1092.7755	1180.3625	1171.6370	1120.7570	1036.1294	936.9106	786.5029	676.4761	636.1307	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	
alpha	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	
util living area													
	0.9928	0.9794	0.9432	0.8388	0.6672	0.4807	0.3483	0.3932	0.6309	0.9051	0.9830	0.9946	(86)
MIT	19.9607	20.1980	20.4963	20.7975	20.9502	20.9928	20.9990	20.9981	20.9717	20.7292	20.2731	19.9036	(87)
Th 2	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	(88)
util rest of house													
	0.9906	0.9735	0.9279	0.8028	0.6114	0.4138	0.2758	0.3153	0.5561	0.8732	0.9771	0.9930	(89)
MIT 2	18.8776	19.1767	19.5437	19.8895	20.0419	20.0761	20.0796	20.0793	20.0626	19.8251	19.2743	18.8051	(90)
Living area fraction										fLA = Living area / (4) =		0.3480	(91)
MIT	19.2545	19.5322	19.8752	20.2055	20.3580	20.3952	20.3996	20.3990	20.3790	20.1398	19.6219	19.1874	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2545	19.5322	19.8752	20.2055	20.3580	20.3952	20.3996	20.3990	20.3790	20.1398	19.6219	19.1874	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9879	0.9691	0.9240	0.8081	0.6288	0.4369	0.3011	0.3424	0.5811	0.8756	0.9733	0.9908	(94)
Useful gains	665.3779	793.2070	875.3162	883.0701	742.1555	511.9087	337.4120	354.8055	544.4377	688.6432	658.4100	630.2839	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1329.3010	1300.6443	1188.9156	1004.9429	769.6065	515.1282	337.7430	355.4723	558.1376	847.9848	1113.0673	1332.2211	(97)
Space heating kWh													
	493.9588	340.9979	233.3180	87.7484	20.4236	0.0000	0.0000	0.0000	0.0000	118.5501	327.3532	522.2413	(98a)
Space heating requirement - total per year (kWh/year)												2144.5913	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	493.9588	340.9979	233.3180	87.7484	20.4236	0.0000	0.0000	0.0000	0.0000	118.5501	327.3532	522.2413	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2144.5913	
Space heating per m2											(98c) / (4) =	24.2245	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	493.9588	340.9979	233.3180	87.7484	20.4236	0.0000	0.0000	0.0000	0.0000	118.5501	327.3532	522.2413	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	493.9588	340.9979	233.3180	87.7484	20.4236	0.0000	0.0000	0.0000	0.0000	118.5501	327.3532	522.2413	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2144.5913	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	749.5372	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3147.2332	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2144.5913	0.1570	336.6950	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			442.5329	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			478.7418	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.4100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2144.5913	1.5812	3390.9899	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			4531.8884	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			4918.9039	(286)
Dwelling Primary energy Rate (DPER)			55.5600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300 (1b)	x	2.5500 (2b)	=	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	225.7515	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1329	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3829	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3255	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4150	0.4068	0.3987	0.3580	0.3499	0.3092	0.3092	0.3010	0.3255	0.3499	0.3661	0.3824	(22b)
Effective ac	0.5861	0.5828	0.5795	0.5641	0.5612	0.5478	0.5478	0.5453	0.5530	0.5612	0.5670	0.5731	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			20.0800	1.1450	22.9924			(27)
Brickwork	63.7500	20.0800	43.6700	0.1800	7.8606			(29a)
Communal Wall	20.4900	2.0600	18.4300	0.1800	3.3174			(29a)
Stairwell Wall	15.9200		15.9200	0.1800	2.8656			(29a)
Total net area of external elements Aum(A, m2)			100.1600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.0960			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.7512 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0700	4.2938
E16 Corner (normal)	11.5800	0.0900	1.0422
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0900	-0.5184
E18 Party wall between dwellings	2.8800	0.0600	0.1728
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0500	1.8900
E20 Exposed floor (normal)	3.2200	0.3200	1.0304
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.0200	0.0980
E25 Staggered party wall between dwellings	2.8800	0.0600	0.1728

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7481 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 47.8441 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6629	43.4138	43.1697	42.0230	41.8085	40.8098	40.8098	40.6248	41.1945	41.8085	42.2425	42.6962	(38)
Heat transfer coeff	91.5069	91.2579	91.0137	89.8671	89.6526	88.6539	88.6539	88.4689	89.0385	89.6526	90.0866	90.5403	(39)

Average = Sum(39)m / 12 = 89.8661

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0336	1.0308	1.0281	1.0151	1.0127	1.0014	1.0014	0.9993	1.0057	1.0127	1.0176	1.0227	(40)
HLP (average)												1.0151	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)
Hot water usage for baths	29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)
Hot water usage for other uses	41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)

Energy content (annual) Total = Sum(45)m = 2115.0673

Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	265.9895	235.1357	249.4246	218.2505	210.8868	189.2764	186.1876	193.9523	196.5057	220.0343	235.1073	262.9338	(62)
WWHRS	-31.0401	-27.4522	-28.7463	-23.8031	-22.1836	-18.9827	-17.7932	-18.9213	-19.6402	-23.1537	-26.2303	-30.4653	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)

Total per year (kWh/year) = Sum(64)m = 2375.2726 (64)

12Total per year (kWh/year) 2375 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	110.2246	97.8577	104.7168	93.6487	91.9030	84.0148	83.6905	86.2723	86.4186	94.9445	99.2536	109.2086	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.1862	131.9562	119.1862	123.1591	119.1862	123.1591	119.1862	119.1862	123.1591	119.1862	123.1591	119.1862	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)													
	148.1514	145.6216	140.7484	130.0677	123.5255	116.6873	112.4872	115.9573	120.0258	127.6136	137.8523	146.7858	(72)
Total internal gains													
	568.7607	581.4534	557.6299	537.7649	510.6412	489.1661	470.5649	471.5825	485.8042	505.5763	536.3964	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	13.6800	19.6403	0.6300	0.7000	0.7700	82.1117	(76)
Southeast	6.4000	36.7938	0.6300	0.7000	0.7700	71.9659	(77)

Solar gains	154.0776	283.2125	432.2570	593.6234	705.5922	715.1042	683.5967	599.9992	489.2723	326.0807	188.5823	129.1125	(83)
Total gains	722.8383	864.6659	989.8868	1131.3882	1216.2334	1204.2703	1154.1617	1071.5817	975.0764	831.6570	724.9787	686.0793	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.2372	65.4152	65.5907	66.4276	66.5866	67.3367	67.3367	67.4774	67.0457	66.5866	66.2658	65.9337	
alpha	5.3491	5.3610	5.3727	5.4285	5.4391	5.4891	5.4891	5.4985	5.4697	5.4391	5.4177	5.3956	
util living area													
	0.9903	0.9752	0.9365	0.8272	0.6552	0.4671	0.3374	0.3786	0.6105	0.8887	0.9775	0.9925	(86)
MIT	19.9710	20.2065	20.5021	20.8074	20.9531	20.9938	20.9991	20.9984	20.9756	20.7541	20.3094	19.9335	(87)
Th 2	20.0554	20.0577	20.0600	20.0708	20.0728	20.0822	20.0822	20.0839	20.0785	20.0728	20.0687	20.0645	(88)
util rest of house													
	0.9874	0.9682	0.9198	0.7899	0.5993	0.4019	0.2673	0.3038	0.5367	0.8534	0.9700	0.9902	(89)
MIT 2	18.8721	19.1696	19.5334	19.8910	20.0372	20.0789	20.0819	20.0834	20.0638	19.8451	19.3104	18.8314	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.2545	19.5305	19.8705	20.2099	20.3560	20.3973	20.4011	20.4018	20.3812	20.1615	19.6581	19.2150	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2545	19.5305	19.8705	20.2099	20.3560	20.3973	20.4011	20.4018	20.3812	20.1615	19.6581	19.2150	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9634	0.9159	0.7959	0.6168	0.4245	0.2917	0.3299	0.5615	0.8572	0.9658	0.9875	(94)
Useful gains	711.4177	832.9969	906.6612	900.4457	750.2130	511.1922	336.7065	353.4998	547.5423	712.8868	700.1855	677.4825	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1368.4434	1335.1452	1216.9021	1016.3894	776.0287	513.9535	336.9838	354.0375	559.2656	857.2086	1131.3137	1359.4585	(97)
Space heating kWh													
	488.8272	337.4437	230.8193	83.4794	19.2069	0.0000	0.0000	0.0000	0.0000	107.3754	310.4123	507.3901	(98a)
Space heating requirement - total per year (kWh/year)												2084.9543	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	488.8272	337.4437	230.8193	83.4794	19.2069	0.0000	0.0000	0.0000	0.0000	107.3754	310.4123	507.3901	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2084.9543	
Space heating per m2											(98c) / (4) =	23.5508	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	488.8272	337.4437	230.8193	83.4794	19.2069	0.0000	0.0000	0.0000	0.0000	107.3754	310.4123	507.3901	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	529.6069	365.5944	250.0750	90.4436	20.8092	0.0000	0.0000	0.0000	0.0000	116.3331	336.3080	549.7185	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6638	85.1416	84.1607	82.3056	80.5542	79.8000	79.8000	79.8000	79.8000	82.7602	84.9464	85.7609	(217)
Fuel for water heating, kWh/month													
	274.2692	243.9271	262.2106	236.2506	234.2561	213.4006	211.0205	219.3371	221.6360	237.8929	245.8928	271.0658	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.7645	19.8670	17.8881	13.1056	10.1231	8.2707	9.2346	12.0035	15.5914	20.4568	23.1059	25.4528	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4691	-34.6368	-52.0885	-61.3551	-68.5894	-64.8929	-64.0827	-59.2821	-51.2531	-40.8103	-26.3403	-20.1124	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.9372	-19.1683	-38.7962	-59.3119	-79.4625	-80.2372	-79.3113	-66.6912	-48.2676	-27.7712	-12.0453	-7.0415	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2258.8887	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2871.1594	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	199.8640	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1093.9542	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4321.9579	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2258.8887	0.2100	474.3666	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2871.1594	0.2100	602.9435	(264)
Space and water heating			1077.3101	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.8640	0.1443	28.8466	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9127	0.1336	-75.7632	
PV Unit electricity exported	-527.0415	0.1254	-66.0772	
Total			-141.8403	(269)
Total CO2, kg/year			976.2456	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2258.8887	1.1300	2552.5443	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2871.1594	1.1300	3244.4101	(278)
Space and water heating			5796.9544	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.8640	1.5338	306.5581	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9127	1.4939	-846.8903	
PV Unit electricity exported	-527.0415	0.4602	-242.5352	
Total			-1089.4255	(283)
Total Primary energy kWh/year			5144.1878	(286)
Target Primary Energy Rate (TPER)			58.1100	(287)

Full SAP Calculation Printout

Plot Reference	P-38	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-38
Plot Address	Flat 5, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	79 C	**DER**	5.41	**TER**	11.03
Environmental	95 A	**% DER < TER**			50.95
CO_2 Emissions (t/year)	0.4	**DFEE**	31.14	**TFEE**	30.90
Compliance Check	See BREL	**% DFEE < TFEE**			-0.80
% DPER < TPER	4.38	**DPER**	55.56	**TPER**	58.11

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5300 (17)
Infiltration rate		0.1265 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1075 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1371	0.1344	0.1317	0.1183	0.1156	0.1021	0.1021	0.0995	0.1075	0.1156	0.1210	0.1263	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.7500	24.7400	39.0100	0.2100	8.1921	110.0000	4291.1000	(29a)
Communal Wall	20.4900	2.0600	18.4300	0.2000	3.6860	110.0000	2027.3000	(29a)
Stairwell Wall	15.9200		15.9200	0.1600	2.5472	110.0000	1751.2000	(29a)
Total net area of external elements Aum(A, m2)			100.1600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.2255			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	21490.7599 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		242.7512 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	11.5800	0.0540	0.6253
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E20 Exposed floor (normal)	3.2200	0.3200	1.0304
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4149 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.6405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	(39)
Average = Sum(39)m / 12 =												88.8895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	(40)
HLP (average)												1.0041	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)
Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
										Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains	583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	741.6769	871.9844	1005.9722	1136.1045	1215.6574	1193.5049	1142.2328	1059.4965	963.9459	828.8565	726.8638	699.9454	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	
alpha	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	
util living area	0.9887	0.9730	0.9293	0.8215	0.6513	0.4723	0.3418	0.3846	0.6157	0.8878	0.9767	0.9916	(86)
MIT	20.0431	20.2577	20.5490	20.8188	20.9556	20.9934	20.9991	20.9983	20.9748	20.7597	20.3304	19.9818	(87)
Th 2	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	(88)
util rest of house	0.9854	0.9656	0.9114	0.7839	0.5958	0.4063	0.2707	0.3084	0.5417	0.8525	0.9690	0.9891	(89)
MIT 2	18.9817	19.2506	19.6054	19.9113	20.0463	20.0765	20.0797	20.0794	20.0647	19.8575	19.3452	18.9042	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.3511	19.6011	19.9338	20.2272	20.3627	20.3956	20.3996	20.3992	20.3814	20.1715	19.6881	19.2792	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3511	19.6011	19.9338	20.2272	20.3627	20.3956	20.3996	20.3992	20.3814	20.1715	19.6881	19.2792	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9609	0.9081	0.7904	0.6133	0.4292	0.2954	0.3350	0.5666	0.8564	0.9649	0.9862	(94)
Useful gains	728.3254	837.8568	913.5642	897.9219	745.6109	512.2143	337.4468	354.8856	546.1918	709.8705	701.3230	690.2772	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1337.8841	1306.7722	1194.1246	1006.8647	770.0270	515.1651	337.7475	355.4825	558.3502	850.8079	1118.9493	1340.3821	(97)
Space heating kWh	453.5117	315.1111	208.7369	78.4389	18.1656	0.0000	0.0000	0.0000	0.0000	104.8574	300.6909	483.6780	(98a)
Space heating requirement - total per year (kWh/year)												1963.1905	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	453.5117	315.1111	208.7369	78.4389	18.1656	0.0000	0.0000	0.0000	0.0000	104.8574	300.6909	483.6780	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1963.1905	
Space heating per m2											(98c) / (4) =	22.1754	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	453.5117	315.1111	208.7369	78.4389	18.1656	0.0000	0.0000	0.0000	0.0000	104.8574	300.6909	483.6780	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	453.5117	315.1111	208.7369	78.4389	18.1656	0.0000	0.0000	0.0000	0.0000	104.8574	300.6909	483.6780	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1963.1905	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												749.5372	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2965.8324	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1963.1905	16.4900	323.7301	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	16.4900	123.5987	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	16.4900	9.4466	(249)
Energy for lighting	195.8180	16.4900	32.2904	(250)
Additional standing charges			0.0000	(251)
Total energy cost			489.0658	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3185	(257)
SAP value		78.6266	
SAP rating (Section 12)		79	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1963.1905	0.1571	308.3960	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			414.2339	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			450.4428	(272)
CO2 emissions per m2			5.0900	(273)
EI value			95.4797	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 88.5300						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		225.7515	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	

Measured/design AP50												2.5300	(17)
Infiltration rate												0.1265	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1075	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1156	0.1102	0.1102	0.1021	0.1048	0.0914	0.0914	0.0887	0.0914	0.1021	0.0995	0.1075	(22b)

Mechanical extract ventilation - centralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.7500	24.7400	39.0100	0.2100	8.1921	110.0000	4291.1000	(29a)
Communal Wall	20.4900	2.0600	18.4300	0.2000	3.6860	110.0000	2027.3000	(29a)
Stairwell Wall	15.9200		15.9200	0.1600	2.5472	110.0000	1751.2000	(29a)
Total net area of external elements Aum(A, m2)			100.1600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.2255			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21490.7599	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	242.7512	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	11.5800	0.0540	0.6253
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E20 Exposed floor (normal)	3.2200	0.3200	1.0304
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.4149	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	51.6405	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	(39)
Average = Sum(39)m / 12 =												88.8895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	(40)
HLP (average)												1.0041	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6051	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)
Hot water usage for baths	29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)
Hot water usage for other uses	41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)
Average daily hot water use (litres/day)												127.3386	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)

											Total per year (kWh/year) = Sum(64)m =	2432.3983	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354		(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024		(71)
Water heating gains (Table 5)													
98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837		(72)
Total internal gains													
583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032		(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	43.0593	0.3300	0.0000	0.7700	26.9158	(77)
East	16.8600	23.8018	0.3300	0.0000	0.7700	101.9698	(76)
Southeast	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(77)

Solar gains	188.1877	302.5209	458.9184	640.7489	742.9149	796.9067	754.0877	677.9214	554.0398	374.0043	226.9565	158.5693	(83)
Total gains	772.0507	884.4153	1022.1173	1168.7653	1235.7728	1257.8633	1196.0501	1122.7928	1016.8018	868.8559	760.6631	726.2725	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	
alpha	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	
util living area													
	0.9831	0.9647	0.9070	0.7661	0.5696	0.3665	0.2452	0.2690	0.5171	0.8333	0.9629	0.9872	(86)
MIT	20.1664	20.3544	20.6410	20.8837	20.9795	20.9984	20.9999	20.9998	20.9904	20.8466	20.4610	20.1128	(87)
Th 2	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	(88)
util rest of house													
	0.9781	0.9549	0.8838	0.7211	0.5097	0.3021	0.1769	0.1963	0.4412	0.7856	0.9506	0.9832	(89)
MIT 2	19.1377	19.3709	19.7141	19.9784	20.0662	20.0793	20.0799	20.0799	20.0751	19.9491	19.5066	19.0706	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.4957	19.7132	20.0367	20.2934	20.3841	20.3992	20.4001	20.4000	20.3937	20.2614	19.8388	19.4333	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4957	19.7132	20.0367	20.2934	20.3841	20.3992	20.4001	20.4000	20.3937	20.2614	19.8388	19.4333	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9501	0.8826	0.7320	0.5298	0.3245	0.2006	0.2216	0.4674	0.7959	0.9466	0.9797	(94)
Useful gains	752.0551	840.3170	902.0856	855.5758	654.7321	408.2348	239.9802	248.8440	475.2825	691.4908	720.0719	711.5119	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
1279.6304	1245.6254	1123.2705	923.8680	665.2556	408.8205	240.0092	248.8945	479.4396	778.7994	1052.3431	1274.0813		(97)
Space heating kWh													
392.5160	272.3673	164.5615	49.1704	7.8295	0.0000	0.0000	0.0000	0.0000	64.9576	239.2353	418.5517		(98a)
Space heating requirement - total per year (kWh/year)												1609.1893	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
392.5160	272.3673	164.5615	49.1704	7.8295	0.0000	0.0000	0.0000	0.0000	64.9576	239.2353	418.5517		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1609.1893	
Space heating per m2											(98c) / (4) =	18.1768	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	392.5160	272.3673	164.5615	49.1704	7.8295	0.0000	0.0000	0.0000	0.0000	64.9576	239.2353	418.5517	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)

392.5160	272.3673	164.5615	49.1704	7.8295	0.0000	0.0000	0.0000	0.0000	64.9576	239.2353	418.5517	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)

Efficiency of water heater 324.5200 (216)

(217)m 324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)

Fuel for water heating, kWh/month

75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting 24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	1609.1893	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	749.5372	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2611.8312	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1609.1893	27.6700	445.2627	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	27.6700	207.3970	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	27.6700	15.8512	(249)
Energy for lighting	195.8180	27.6700	54.1828	(250)
Additional standing charges			0.0000	(251)
Total energy cost			722.6937	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1609.1893	0.1578	253.9843	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			359.8222	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			396.0312	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1609.1893	1.5843	2549.3791	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			3690.2777	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			4077.2932	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 79
Current environmental impact rating: A 95

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: C 79
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£723	£723	£0
Space heating	£461	£461	£0
Water heating	£207	£207	£0
Lighting	£54	£54	£0
Total cost of fuels	£723	£723	£0
Total cost of uses	£722	£722	£0
Delivered energy	30 kWh/m²	30 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	46 kWh/m²	46 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	225.7515	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.5300	(17)
Infiltration rate		0.1265	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1075	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1371	0.1344	0.1317	0.1183	0.1156	0.1021	0.1021	0.0995	0.1075	0.1156	0.1210	0.1263	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.7500	24.7400	39.0100	0.2100	8.1921	110.0000	4291.1000	(29a)
Communal Wall	20.4900	2.0600	18.4300	0.2000	3.6860	110.0000	2027.3000	(29a)
Stairwell Wall	15.9200		15.9200	0.1600	2.5472	110.0000	1751.2000	(29a)
Total net area of external elements Aum(A, m2)			100.1600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.2255			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	21490.7599 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		242.7512 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	11.5800	0.0540	0.6253
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E20 Exposed floor (normal)	3.2200	0.3200	1.0304
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.4149 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	51.6405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	(39)
Average = Sum(39)m / 12 =												88.8895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	(40)
HLP (average)												1.0041	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6051	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day)	127.3386	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
									Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)													
	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains													
	583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	741.6769	871.9844	1005.9722	1136.1045	1215.6574	1193.5049	1142.2328	1059.4965	963.9459	828.8565	726.8638	699.9454	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	
alpha	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	
util living area													
	0.9887	0.9730	0.9293	0.8215	0.6513	0.4723	0.3418	0.3846	0.6157	0.8878	0.9767	0.9916	(86)
MIT	20.0431	20.2577	20.5490	20.8188	20.9556	20.9934	20.9991	20.9983	20.9748	20.7597	20.3304	19.9818	(87)
Th 2	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	(88)
util rest of house													
	0.9854	0.9656	0.9114	0.7839	0.5958	0.4063	0.2707	0.3084	0.5417	0.8525	0.9690	0.9891	(89)
MIT 2	18.9817	19.2506	19.6054	19.9113	20.0463	20.0765	20.0797	20.0794	20.0647	19.8575	19.3452	18.9042	(90)
Living area fraction										fLA = Living area / (4) =		0.3480	(91)
MIT	19.3511	19.6011	19.9338	20.2272	20.3627	20.3956	20.3996	20.3992	20.3814	20.1715	19.6881	19.2792	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3511	19.6011	19.9338	20.2272	20.3627	20.3956	20.3996	20.3992	20.3814	20.1715	19.6881	19.2792	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9609	0.9081	0.7904	0.6133	0.4292	0.2954	0.3350	0.5666	0.8564	0.9649	0.9862	(94)
Useful gains	728.3254	837.8568	913.5642	897.9219	745.6109	512.2143	337.4468	354.8856	546.1918	709.8705	701.3230	690.2772	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1337.8841	1306.7722	1194.1246	1006.8647	770.0270	515.1651	337.7475	355.4825	558.3502	850.8079	1118.9493	1340.3821	(97)
Space heating kWh													
	453.5117	315.1111	208.7369	78.4389	18.1656	0.0000	0.0000	0.0000	0.0000	104.8574	300.6909	483.6780	(98a)
Space heating requirement - total per year (kWh/year)												1963.1905	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	453.5117	315.1111	208.7369	78.4389	18.1656	0.0000	0.0000	0.0000	0.0000	104.8574	300.6909	483.6780	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1963.1905	
Space heating per m2											(98c) / (4) =	22.1754	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	453.5117	315.1111	208.7369	78.4389	18.1656	0.0000	0.0000	0.0000	0.0000	104.8574	300.6909	483.6780	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	453.5117	315.1111	208.7369	78.4389	18.1656	0.0000	0.0000	0.0000	0.0000	104.8574	300.6909	483.6780	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1963.1905	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	749.5372	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2965.8324	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1963.1905	16.4900	323.7301	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	16.4900	123.5987	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	16.4900	9.4466	(249)
Energy for lighting	195.8180	16.4900	32.2904	(250)
Additional standing charges			0.0000	(251)
Total energy cost			489.0658	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3185	(257)
SAP value		78.6266	
SAP rating (Section 12)		79	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1963.1905	0.1571	308.3960	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			414.2339	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			450.4428	(272)
CO2 emissions per m2			5.0900	(273)
EI value			95.4797	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b) x	2.5500	(2b) =	225.7515	(1b) - (3b)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 88.5300 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 225.7515 (5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.5300 (17)
Infiltration rate		0.1265 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1075 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1156	0.1102	0.1102	0.1021	0.1048	0.0914	0.0914	0.0887	0.0914	0.1021	0.0995	0.1075	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.7500	24.7400	39.0100	0.2100	8.1921	110.0000	4291.1000	(29a)
Communal Wall	20.4900	2.0600	18.4300	0.2000	3.6860	110.0000	2027.3000	(29a)
Stairwell Wall	15.9200		15.9200	0.1600	2.5472	110.0000	1751.2000	(29a)
Total net area of external elements Aum(A, m2)			100.1600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.2255			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21490.7599 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 242.7512 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	11.5800	0.0540	0.6253
E17 Corner (inverted - internal area greater than external area)	5.7600	-0.0970	-0.5587
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E20 Exposed floor (normal)	3.2200	0.3200	1.0304
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170
E25 Staggered party wall between dwellings	2.8800	0.0310	0.0893

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4149 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.6405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	88.8895	(39)
Average = Sum(39)m / 12 =												88.8895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	1.0041	(40)
HLP (average)												1.0041	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

Hot water usage for mixer showers	67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)
Hot water usage for baths	29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)
Hot water usage for other uses	41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)
Average daily hot water use (litres/day)												127.3386	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use

	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)											Total = Sum(45)m =	2115.0673	
Distribution loss (46)m = 0.15 x (45)m													
	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
										Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)													
	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains													
	583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	43.0593	0.3300	0.0000	0.7700	26.9158	(77)
East	16.8600	23.8018	0.3300	0.0000	0.7700	101.9698	(76)
Southeast	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(77)

Solar gains	188.1877	302.5209	458.9184	640.7489	742.9149	796.9067	754.0877	677.9214	554.0398	374.0043	226.9565	158.5693	(83)
Total gains	772.0507	884.4153	1022.1173	1168.7653	1235.7728	1257.8633	1196.0501	1122.7928	1016.8018	868.8559	760.6631	726.2725	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	67.1582	
alpha	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	5.4772	
util living area													
	0.9831	0.9647	0.9070	0.7661	0.5696	0.3665	0.2452	0.2690	0.5171	0.8333	0.9629	0.9872	(86)
MIT	20.1664	20.3544	20.6410	20.8837	20.9795	20.9984	20.9999	20.9998	20.9904	20.8466	20.4610	20.1128	(87)
Th 2	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	20.0800	(88)
util rest of house													
	0.9781	0.9549	0.8838	0.7211	0.5097	0.3021	0.1769	0.1963	0.4412	0.7856	0.9506	0.9832	(89)
MIT 2	19.1377	19.3709	19.7141	19.9784	20.0662	20.0793	20.0799	20.0799	20.0751	19.9491	19.5066	19.0706	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.4957	19.7132	20.0367	20.2934	20.3841	20.3992	20.4001	20.4000	20.3937	20.2614	19.8388	19.4333	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4957	19.7132	20.0367	20.2934	20.3841	20.3992	20.4001	20.4000	20.3937	20.2614	19.8388	19.4333	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9501	0.8826	0.7320	0.5298	0.3245	0.2006	0.2216	0.4674	0.7959	0.9466	0.9797	(94)
Useful gains	752.0551	840.3170	902.0856	855.5758	654.7321	408.2348	239.9802	248.8440	475.2825	691.4908	720.0719	711.5119	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1279.6304	1245.6254	1123.2705	923.8680	665.2556	408.8205	240.0092	248.8945	479.4396	778.7994	1052.3431	1274.0813	(97)
Space heating kWh													
	392.5160	272.3673	164.5615	49.1704	7.8295	0.0000	0.0000	0.0000	0.0000	64.9576	239.2353	418.5517	(98a)
Space heating requirement - total per year (kWh/year)												1609.1893	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

392.5160	272.3673	164.5615	49.1704	7.8295	0.0000	0.0000	0.0000	0.0000	64.9576	239.2353	418.5517	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1609.1893

Space heating per m2 (98c) / (4) = 18.1768 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	392.5160	272.3673	164.5615	49.1704	7.8295	0.0000	0.0000	0.0000	0.0000	64.9576	239.2353	418.5517	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	392.5160	272.3673	164.5615	49.1704	7.8295	0.0000	0.0000	0.0000	0.0000	64.9576	239.2353	418.5517	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1609.1893 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 749.5372 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 57.2867 (230a)
Total electricity for the above, kWh/year 57.2867 (231)
Electricity for lighting (calculated in Appendix L) 195.8180 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2611.8312 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1609.1893	27.6700	445.2627	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	27.6700	207.3970	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	27.6700	15.8512	(249)
Energy for lighting	195.8180	27.6700	54.1828	(250)
Additional standing charges			0.0000	(251)
Total energy cost			722.6937	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1609.1893	0.1578	253.9843	(261)

Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			359.8222	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			396.0312	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1609.1893	1.5843	2549.3791	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			3690.2777	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			4077.2932	(286)

Summary for Input Data

Plot Reference	P-39	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-39
Plot Address	Flat 6, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.21	**TER**	11.45
Environmental	96 A	**% DER < TER**			54.50
CO_2 Emissions (t/year)	0.3	**DFEE**	29.59	**TFEE**	27.13
Compliance Check	See BREL	**% DFEE < TFEE**			-9.06
% DPER < TPER	11.34	**DPER**	53.70	**TPER**	60.57

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	22.17 m	68.26 m²	2.55 m

8.0 Living Area	24.42	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	57.48	36.82	0.00	None	20.66	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.38	4.32	0.90	Stairwell Access Corridor 4	2.06	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	39.84	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	165.94

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	68.26

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)

Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted		70.00	68.26

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	East	2.06	
Patio Door	Patio Door	Brickwork	West	5.42	
SE	Window	Brickwork	South East	5.45	
West	Window	Brickwork	West	9.79	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	39.94	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	5.76	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.88	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	8.55	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	27.68	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	9.63	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	32.89	0.02	0.02	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.40	0.33	0.33	AbbeyCalculated	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	13.83	0.00	0.00		No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa

Summary for Input Data

elmhurst energy

Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.83	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	10
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	

25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	

26.0 Heat Networks	None	

27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	Yes	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro	None	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

Summary for Input Data

None

Full SAP Calculation Printout

Plot Reference	P-39	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-39
Plot Address	Flat 6, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.21	**TER**	11.45
Environmental	96 A	**% DER < TER**			54.50
CO_2 Emissions (t/year)	0.3	**DFEE**	29.59	**TFEE**	27.13
Compliance Check	See BREL	**% DFEE < TFEE**			-9.06
% DPER < TPER	11.34	**DPER**	53.70	**TPER**	60.57

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.0630	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.8300 (17)
Infiltration rate		0.1915 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1628 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2075	0.2035	0.1994	0.1791	0.1750	0.1546	0.1546	0.1506	0.1628	0.1750	0.1831	0.1913	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	57.4800	20.6600	36.8200	0.2100	7.7322	110.0000	4050.1999	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2000	0.8640	110.0000	475.2000	(29a)
Total net area of external elements Aum(A, m2)			63.8600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.7247			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			165.9400			9.0000	1493.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17227.2600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		252.3771 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.9400	0.0380	1.5177
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.5500	0.0380	0.3249
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	32.8900	0.0160	0.5262
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8300	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.3340 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0587 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	(39)
Average = Sum(39)m / 12 =												67.7791	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	(40)
HLP (average)												0.9930	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)
Hot water usage for mixer showers

61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)											Total = Sum(45)m =	1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
											Total per year (kWh/year) = Sum(64)m =	2222.4248	(64)
12Total per year (kWh/year)												2222	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4484	107.8893	97.4484	100.6967	97.4484	100.6967	97.4484	97.4484	100.6967	97.4484	100.6967	97.4484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains	435.0134	445.1807	425.2984	408.1709	385.4533	369.7820	354.2259	355.3466	367.3114	381.6530	407.7002	425.2587	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	126.8606	235.2831	363.2959	503.7918	601.8990	611.0565	583.7249	510.4736	412.9979	272.1207	155.6778	106.0279	(83)
Total gains	561.8740	680.4638	788.5944	911.9627	987.3523	980.8385	937.9508	865.8202	780.3093	653.7737	563.3780	531.2866	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	
alpha	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	
util living area	0.9907	0.9735	0.9271	0.8023	0.6197	0.4399	0.3176	0.3594	0.5860	0.8810	0.9779	0.9931	(86)
MIT	20.0771	20.3120	20.5962	20.8580	20.9703	20.9963	20.9995	20.9991	20.9833	20.7931	20.3724	20.0197	(87)
Th 2	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	(88)
util rest of house	0.9878	0.9660	0.9084	0.7627	0.5652	0.3784	0.2521	0.2886	0.5142	0.8439	0.9703	0.9909	(89)
MIT 2	19.0287	19.3230	19.6678	19.9599	20.0674	20.0873	20.0891	20.0889	20.0795	19.9009	19.4022	18.9560	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.4038	19.6768	19.9999	20.2812	20.3904	20.4125	20.4148	20.4145	20.4028	20.2201	19.7493	19.3365	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4038	19.6768	19.9999	20.2812	20.3904	20.4125	20.4148	20.4145	20.4028	20.2201	19.7493	19.3365	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9618	0.9063	0.7715	0.5835	0.4003	0.2755	0.3140	0.5394	0.8498	0.9668	0.9886	(94)
Useful gains	553.4615	654.4903	714.6957	703.5991	576.1610	392.6705	258.4428	271.8475	420.8760	555.5550	544.6694	525.2216	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1023.7221	1001.5605	915.0122	771.4071	589.0275	393.9667	258.5628	272.1000	427.1981	652.0411	857.3586	1025.9408	(97)
Space heating kWh	349.8739	233.2312	149.0355	48.8217	9.5727	0.0000	0.0000	0.0000	0.0000	71.7857	225.1362	372.5351	(98a)
Space heating requirement - total per year (kWh/year)												1459.9920	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	349.8739	233.2312	149.0355	48.8217	9.5727	0.0000	0.0000	0.0000	0.0000	71.7857	225.1362	372.5351	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1459.9920	
Space heating per m2											(98c) / (4) =	21.3887	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	349.8739	233.2312	149.0355	48.8217	9.5727	0.0000	0.0000	0.0000	0.0000	71.7857	225.1362	372.5351	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	349.8739	233.2312	149.0355	48.8217	9.5727	0.0000	0.0000	0.0000	0.0000	71.7857	225.1362	372.5351	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1459.9920	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												684.8345	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2349.0684	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1459.9920	0.1574	229.8756	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			326.5530	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			355.7832	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1459.9920	1.5828	2310.9290	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			3353.2503	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			3665.5944	(286)
Dwelling Primary energy Rate (DPER)			53.7000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1149	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3649	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3102	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3644	(22b)
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			15.0100	1.1450	17.1870			(27)
Brickwork	57.4800	15.0100	42.4700	0.1800	7.6446			(29a)
Communal Wall	6.3800	2.0600	4.3200	0.1800	0.7776			(29a)
Total net area of external elements Aum(A, m2)			63.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6692			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 252.3771 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.9400	0.0700	2.7958
E16 Corner (normal)	5.7600	0.0900	0.5184
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0900	-0.2592
E18 Party wall between dwellings	8.5500	0.0600	0.5130
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	32.8900	0.0500	1.6445
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.0200	0.0880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8300	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.7820 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.4512 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.2120	33.0376	32.8666	32.0636	31.9134	31.2140	31.2140	31.0845	31.4834	31.9134	32.2173	32.5350	(38)
Heat transfer coeff	66.6632	66.4888	66.3178	65.5148	65.3646	64.6652	64.6652	64.5357	64.9346	65.3646	65.6685	65.9863	(39)

Average = Sum(39)m / 12 = 65.5141

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9766	0.9741	0.9715	0.9598	0.9576	0.9473	0.9473	0.9454	0.9513	0.9576	0.9620	0.9667	(40)
HLP (average)												0.9598	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	244.2086	215.9707	229.2891	201.0606	194.5772	174.9630	172.3298	179.3233	181.4738	202.8156	216.2432	241.4563	(62)
WWHRS	-27.9594	-24.7276	-25.8933	-21.4407	-19.9819	-17.0987	-16.0273	-17.0434	-17.6909	-20.8557	-23.6270	-27.4417	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
										Total per year (kWh/year) = Sum(64)m =		2193.9237	(64)
12Total per year (kWh/year)												2194	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.9825	91.4853	98.0217	87.9331	86.4800	79.2556	79.0828	81.4081	81.4205	89.2193	92.9813	102.0673	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4835	107.9282	97.4835	100.7329	97.4835	100.7329	97.4835	97.4835	100.7329	97.4835	100.7329	97.4835	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	138.4173	136.1389	131.7496	122.1293	116.2366	110.0773	106.2940	109.4195	113.0840	119.9184	129.1407	137.1873	(72)

Total internal gains													
	488.1505	498.3216	478.4355	461.3092	438.5904	419.9203	404.3630	405.4837	417.4497	434.7901	460.8385	478.3958	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.9600	36.7938	0.6300	0.7000	0.7700	44.5289	(77)
West	11.0500	19.6403	0.6300	0.7000	0.7700	66.3256	(80)

Solar gains	110.8545	205.5962	317.4550	440.2207	525.9468	533.9482	510.0658	446.0588	360.8847	237.7853	136.0356	92.6504	(83)
Total gains	599.0050	703.9178	795.8906	901.5299	964.5372	953.8685	914.4288	851.5424	778.3344	672.5754	596.8741	571.0463	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.7840	71.9723	72.1578	73.0422	73.2101	74.0019	74.0019	74.1504	73.6949	73.2101	72.8713	72.5204	
alpha	5.7856	5.7982	5.8105	5.8695	5.8807	5.9335	5.9335	5.9434	5.9130	5.8807	5.8581	5.8347	
util living area													
	0.9870	0.9680	0.9207	0.7943	0.6141	0.4321	0.3109	0.3482	0.5661	0.8592	0.9696	0.9898	(86)
MIT	20.1599	20.3736	20.6314	20.8763	20.9749	20.9973	20.9997	20.9994	20.9880	20.8354	20.4610	20.1240	(87)
Th 2	20.1029	20.1050	20.1071	20.1170	20.1188	20.1275	20.1275	20.1290	20.1241	20.1188	20.1151	20.1112	(88)
util rest of house													
	0.9832	0.9593	0.9010	0.7550	0.5613	0.3740	0.2494	0.2825	0.4983	0.8194	0.9597	0.9867	(89)
MIT 2	19.1437	19.4115	19.7242	20.0046	20.1004	20.1261	20.1274	20.1289	20.1172	19.9715	19.5316	19.1049	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.5072	19.7557	20.0488	20.3164	20.4132	20.4378	20.4394	20.4403	20.4287	20.2806	19.8641	19.4695	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5072	19.7557	20.0488	20.3164	20.4132	20.4378	20.4394	20.4403	20.4287	20.2806	19.8641	19.4695	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9799	0.9552	0.8996	0.7643	0.5793	0.3948	0.2714	0.3060	0.5222	0.8274	0.9564	0.9839	(94)
Useful gains	586.9922	672.3938	715.9769	689.0407	558.7222	376.5666	248.1987	260.5836	406.4550	556.4563	570.8246	561.8505	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1013.7633	987.7385	898.5247	747.9459	569.5379	377.5002	248.2778	260.7430	410.9519	632.7669	838.1974	1007.5764	(97)
Space heating kWh													
	317.5177	211.9117	135.8155	42.4117	8.0469	0.0000	0.0000	0.0000	0.0000	56.7751	192.5084	331.6200	(98a)
Space heating requirement - total per year (kWh/year)												1296.6070	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	317.5177	211.9117	135.8155	42.4117	8.0469	0.0000	0.0000	0.0000	0.0000	56.7751	192.5084	331.6200	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1296.6070	
Space heating per m2										(98c) / (4) =		18.9951	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	317.5177	211.9117	135.8155	42.4117	8.0469	0.0000	0.0000	0.0000	0.0000	56.7751	192.5084	331.6200	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	344.0062	229.5901	147.1458	45.9499	8.7182	0.0000	0.0000	0.0000	0.0000	61.5115	208.5681	359.2850	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9198	84.2905	83.1752	81.3754	80.1579	79.8000	79.8000	79.8000	79.8000	81.7709	84.0585	85.0382	(217)
Fuel for water heating, kWh/month													
	254.6510	226.8859	244.5389	220.7299	217.8141	197.8249	195.8678	203.3583	205.2416	222.5240	229.1454	251.6687	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.2551	16.2494	14.6308	10.7192	8.2798	6.7647	7.5531	9.8178	12.7524	16.7318	18.8985	20.8181	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3097	-27.1386	-40.9912	-48.5120	-54.4468	-51.6084	-50.9824	-47.0686	-40.5400	-32.0903	-20.5958	-15.6793	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.6768	-14.3472	-29.0843	-44.5269	-59.7069	-60.2924	-59.5798	-50.0617	-36.1942	-20.7887	-9.0010	-5.2574	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1404.7746	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2670.2507	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	163.4706	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-843.4804	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3481.0155	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1404.7746	0.2100	295.0027	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2670.2507	0.2100	560.7527	(264)
Space and water heating			855.7553	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.4706	0.1443	23.5939	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9631	0.1335	-59.8221	
PV Unit electricity exported	-395.5173	0.1253	-49.5743	
Total			-109.3964	(269)
Total CO2, kg/year			781.8820	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1404.7746	1.1300	1587.3953	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2670.2507	1.1300	3017.3833	(278)
Space and water heating			4604.7786	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.4706	1.5338	250.7367	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9631	1.4935	-669.0288	
PV Unit electricity exported	-395.5173	0.4601	-181.9614	
Total			-850.9903	(283)
Total Primary energy kWh/year			4134.6258	(286)
Target Primary Energy Rate (TPER)			60.5700	(287)

Full SAP Calculation Printout

Plot Reference	P-39	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-39
Plot Address	Flat 6, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.21	**TER**	11.45
Environmental	96 A	**% DER < TER**			54.50
CO_2 Emissions (t/year)	0.3	**DFEE**	29.59	**TFEE**	27.13
Compliance Check	See BREL	**% DFEE < TFEE**			-9.06
% DPER < TPER	11.34	**DPER**	53.70	**TPER**	60.57

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

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2. Ventilation rate

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		m3 per hour		
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		2 * 10 =	20.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1149	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.8300	(17)
Infiltration rate			0.3064	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2604	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3321	0.3256	0.3190	0.2865	0.2800	0.2474	0.2474	0.2409	0.2604	0.2800	0.2930	0.3060	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5551	0.5530	0.5509	0.5410	0.5392	0.5306	0.5306	0.5290	0.5339	0.5392	0.5429	0.5468	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	57.4800	20.6600	36.8200	0.2100	7.7322	110.0000	4050.1999	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2000	0.8640	110.0000	475.2000	(29a)
Total net area of external elements Aum(A, m2)			63.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.7247			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			165.9400			9.0000	1493.4600	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17227.2600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							252.3771	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	39.9400	0.0380	1.5177	

E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.5500	0.0380	0.3249
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	32.8900	0.0160	0.5262
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8300	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.3340 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0587 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8873	31.7643	31.6437	31.0776	30.9717	30.4785	30.4785	30.3872	30.6685	30.9717	31.1859	31.4100	(38)
Heat transfer coeff	70.9460	70.8230	70.7025	70.1363	70.0304	69.5373	69.5373	69.4460	69.7272	70.0304	70.2447	70.4687	(39)

Average = Sum(39)m / 12 = 70.1358

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0393	1.0375	1.0358	1.0275	1.0259	1.0187	1.0187	1.0174	1.0215	1.0259	1.0291	1.0324	(40)
HLP (average)												1.0275	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 58.3103 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.6162	61.8713	59.9662	57.5948	55.4794	53.2809	52.8240	54.7252	56.6751	58.9328	61.3252	63.5268	(44)
Energy conte	100.7525	88.1039	92.1658	78.8444	74.6859	65.5151	63.8860	67.7612	69.8861	79.9713	87.3690	99.4677	(45)
Energy content (annual)										Total = Sum(45)m =		968.4090	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(64)
										Total per year (kWh/year) = Sum(64)m =		823.1476	(64)
12Total per year (kWh/year)												823	(64)
Electric shower(s)	48.9784	43.6401	47.6533	45.4750	46.3283	44.1927	45.6658	46.3283	45.4750	47.6533	46.7573	48.9784	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		557.1259	(64a)
Heat gains from water heating, kWh/month	33.6545	29.6321	31.4986	28.1232	27.4528	24.9701	24.9922	25.9813	26.2195	28.9072	30.2552	33.3815	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4484	107.8893	97.4484	100.6967	97.4484	100.6967	97.4484	97.4484	100.6967	97.4484	100.6967	97.4484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	45.2345	44.0954	42.3368	39.0600	36.8990	34.6808	33.5917	34.9211	36.4160	38.8538	42.0212	44.8676	(72)
Total internal gains	391.9326	403.2392	385.9876	375.2037	356.2177	344.4875	331.6256	330.9502	340.7455	350.6904	370.6827	383.0411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	126.8606	235.2831	363.2959	503.7918	601.8990	611.0565	583.7249	510.4736	412.9979	272.1207	155.6778	106.0279	(83)
Total gains	518.7933	638.5223	749.2836	878.9955	958.1167	955.5440	915.3505	841.4238	753.7434	622.8111	526.3606	489.0690	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.4506	67.5677	67.6829	68.2293	68.3325	68.8171	68.8171	68.9075	68.6296	68.3325	68.1240	67.9075	
alpha	5.4967	5.5045	5.5122	5.5486	5.5555	5.5878	5.5878	5.5938	5.5753	5.5555	5.5416	5.5272	
util living area	0.9940	0.9815	0.9451	0.8320	0.6521	0.4622	0.3338	0.3786	0.6184	0.9053	0.9847	0.9956	(86)
MIT	19.9357	20.1829	20.4954	20.8130	20.9577	20.9947	20.9993	20.9986	20.9760	20.7378	20.2700	19.8900	(87)
Th 2	20.0507	20.0522	20.0536	20.0605	20.0618	20.0678	20.0678	20.0689	20.0655	20.0618	20.0592	20.0565	(88)
util rest of house	0.9921	0.9759	0.9296	0.7942	0.5951	0.3965	0.2633	0.3025	0.5427	0.8724	0.9792	0.9941	(89)
MIT 2	19.0919	19.3362	19.6371	19.9256	20.0373	20.0656	20.0676	20.0685	20.0544	19.8716	19.4298	19.0512	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.3938	19.6391	19.9441	20.2430	20.3665	20.3980	20.4009	20.4013	20.3841	20.1815	19.7304	19.3513	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3938	19.6391	19.9441	20.2430	20.3665	20.3980	20.4009	20.4013	20.3841	20.1815	19.7304	19.3513	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9729	0.9276	0.8021	0.6141	0.4200	0.2885	0.3298	0.5692	0.8772	0.9767	0.9927	(94)
Useful gains	513.7676	621.2468	695.0108	705.0186	588.3846	401.2937	264.1233	277.4922	429.0006	546.3142	514.0987	485.5057	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1070.8449	1043.8703	950.5334	795.5595	606.9209	403.1769	264.3052	277.8711	438.1745	670.9956	887.2197	1067.6933	(97)
Space heating kWh	414.4655	284.0030	190.1088	65.1894	13.7909	0.0000	0.0000	0.0000	0.0000	92.7630	268.6471	433.1476	(98a)
Space heating requirement - total per year (kWh/year)												1762.1153	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.4655	284.0030	190.1088	65.1894	13.7909	0.0000	0.0000	0.0000	0.0000	92.7630	268.6471	433.1476	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1762.1153	
Space heating per m2										(98c) / (4) =		25.8148	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	653.6504	514.5758	527.7893	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9753	0.9898	0.9831	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	637.4821	509.3179	518.8792	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1080.3660	1035.2944	950.7755	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	318.8764	391.3265	321.3308	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	79.7191	97.8316	80.3327	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												257.8834	(107)
Energy for space heating												25.8148	(99)
Energy for space cooling												3.7780	(108)
Total												29.5927	(109)
Fabric Energy Efficiency (DFEE)												29.6	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1149 (8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3649	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3102	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3644	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			15.0100	1.1450	17.1870			(27)
Brickwork	57.4800	15.0100	42.4700	0.1800	7.6446			(29a)
Communal Wall	6.3800	2.0600	4.3200	0.1800	0.7776			(29a)
Total net area of external elements Aum(A, m2)			63.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6692			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	252.3771	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.9400	0.0700	2.7958
E16 Corner (normal)	5.7600	0.0900	0.5184
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0900	-0.2592
E18 Party wall between dwellings	8.5500	0.0600	0.5130
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	32.8900	0.0500	1.6445
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.0200	0.0880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8300	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.7820	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	33.4512	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.2120	33.0376	32.8666	32.0636	31.9134	31.2140	31.2140	31.0845	31.4834	31.9134	32.2173	32.5350	(38)
Heat transfer coeff	66.6632	66.4888	66.3178	65.5148	65.3646	64.6652	64.6652	64.5357	64.9346	65.3646	65.6685	65.9863	(39)
Average = Sum(39)m / 12 =												65.5141	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9766	0.9741	0.9715	0.9598	0.9576	0.9473	0.9473	0.9454	0.9513	0.9576	0.9620	0.9667	(40)
HLP (average)												0.9598	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2032	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day)	58.3103	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.6162	61.8713	59.9662	57.5948	55.4794	53.2809	52.8240	54.7252	56.6751	58.9328	61.3252	63.5268	(44)
Energy conte	100.7525	88.1039	92.1658	78.8444	74.6859	65.5151	63.8860	67.7612	69.8861	79.9713	87.3690	99.4677	(45)
Energy content (annual)										Total = Sum(45)m =		968.4090	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(64)
									Total per year (kWh/year) = Sum(64)m =		823.1476	(64)
12Total per year (kWh/year)											823	(64)

Electric shower(s)

48.9784	43.6401	47.6533	45.4750	46.3283	44.1927	45.6658	46.3283	45.4750	47.6533	46.7573	48.9784	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 557.1259 (64a)

Heat gains from water heating, kWh/month

33.6545	29.6321	31.4986	28.1232	27.4528	24.9701	24.9922	25.9813	26.2195	28.9072	30.2552	33.3815	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	97.4835	107.9282	97.4835	100.7329	97.4835	100.7329	97.4835	97.4835	100.7329	97.4835	100.7329	97.4835	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)													
	45.2345	44.0954	42.3368	39.0600	36.8990	34.6808	33.5917	34.9211	36.4160	38.8538	42.0212	44.8676	(72)
Total internal gains													
	391.9677	403.2781	386.0227	375.2399	356.2528	344.5238	331.6607	330.9853	340.7817	350.7254	370.7190	383.0761	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.9600	36.7938	0.6300	0.7000	0.7700	44.5289	(77)
West	11.0500	19.6403	0.6300	0.7000	0.7700	66.3256	(80)

Solar gains	110.8545	205.5962	317.4550	440.2207	525.9468	533.9482	510.0658	446.0588	360.8847	237.7853	136.0356	92.6504	(83)
Total gains	502.8222	608.8743	703.4777	815.4607	882.1996	878.4720	841.7265	777.0441	701.6664	588.5107	506.7546	475.7266	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.7840	71.9723	72.1578	73.0422	73.2101	74.0019	74.0019	74.1504	73.6949	73.2101	72.8713	72.5204	
alpha	5.7856	5.7982	5.8105	5.8695	5.8807	5.9335	5.9335	5.9434	5.9130	5.8807	5.8581	5.8347	
util living area													
	0.9945	0.9833	0.9504	0.8421	0.6631	0.4682	0.3377	0.3813	0.6215	0.9086	0.9856	0.9959	(86)
MIT	20.0132	20.2405	20.5281	20.8288	20.9630	20.9959	20.9995	20.9990	20.9807	20.7657	20.3331	19.9766	(87)
Th 2	20.1029	20.1050	20.1071	20.1170	20.1188	20.1275	20.1275	20.1290	20.1241	20.1188	20.1151	20.1112	(88)
util rest of house													
	0.9927	0.9783	0.9365	0.8065	0.6086	0.4057	0.2709	0.3095	0.5496	0.8773	0.9804	0.9946	(89)
MIT 2	19.2109	19.4364	19.7148	19.9923	20.0972	20.1258	20.1273	20.1288	20.1151	19.9479	19.5377	19.1814	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.4979	19.7241	20.0057	20.2916	20.4069	20.4371	20.4394	20.4401	20.4248	20.2405	19.8222	19.4659	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4979	19.7241	20.0057	20.2916	20.4069	20.4371	20.4394	20.4401	20.4248	20.2405	19.8222	19.4659	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9912	0.9757	0.9347	0.8140	0.6268	0.4280	0.2948	0.3352	0.5748	0.8822	0.9783	0.9933	(94)
Useful gains	498.3857	594.0585	657.5090	663.8032	552.9923	376.0188	248.1477	260.4687	403.3405	519.1799	495.7375	472.5547	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1013.1422	985.6333	895.6701	746.3184	569.1233	377.4558	248.2727	260.7319	410.6969	630.1443	835.4497	1007.3371	(97)
Space heating kWh													
	382.9788	263.1383	177.1919	59.4109	12.0015	0.0000	0.0000	0.0000	0.0000	82.5576	244.5928	397.8781	(98a)
Space heating requirement - total per year (kWh/year)												1619.7498	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	382.9788	263.1383	177.1919	59.4109	12.0015	0.0000	0.0000	0.0000	0.0000	82.5576	244.5928	397.8781	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1619.7498	
Space heating per m2											(98c) / (4) =	23.7291	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	607.8530	478.5226	490.4713	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9779	0.9914	0.9857	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	594.4255	474.4101	483.4549	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	990.2426	949.2026	875.4898	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	284.9883	353.2456	291.6740	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	71.2471	88.3114	72.9185	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												232.4770	(107)
Energy for space heating												23.7291	(99)
Energy for space cooling												3.4058	(108)
Total												27.1349	(109)
Fabric Energy Efficiency (TFEE)												27.1	(109)

Full SAP Calculation Printout

Plot Reference	P-39	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-39
Plot Address	Flat 6, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.21	**TER**	11.45
Environmental	96 A	**% DER < TER**			54.50
CO_2 Emissions (t/year)	0.3	**DFEE**	29.59	**TFEE**	27.13
Compliance Check	See BREL	**% DFEE < TFEE**			-9.06
% DPER < TPER	11.34	**DPER**	53.70	**TPER**	60.57

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.0630	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.8300 (17)
Infiltration rate		0.1915 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1628 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2075	0.2035	0.1994	0.1791	0.1750	0.1546	0.1546	0.1506	0.1628	0.1750	0.1831	0.1913	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	57.4800	20.6600	36.8200	0.2100	7.7322	110.0000	4050.1999	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2000	0.8640	110.0000	475.2000	(29a)
Total net area of external elements Aum(A, m2)			63.8600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.7247			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			165.9400			9.0000	1493.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17227.2600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		252.3771 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.9400	0.0380	1.5177
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.5500	0.0380	0.3249
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	32.8900	0.0160	0.5262
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8300	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.3340 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0587 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	(39)
Average = Sum(39)m / 12 =												67.7791	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	(40)
HLP (average)												0.9930	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)
Hot water usage for mixer showers

61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)											Total = Sum(45)m =	1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
											Total per year (kWh/year) = Sum(64)m =	2222.4248	(64)
12Total per year (kWh/year)												2222	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4484	107.8893	97.4484	100.6967	97.4484	100.6967	97.4484	97.4484	100.6967	97.4484	100.6967	97.4484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains	435.0134	445.1807	425.2984	408.1709	385.4533	369.7820	354.2259	355.3466	367.3114	381.6530	407.7002	425.2587	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	126.8606	235.2831	363.2959	503.7918	601.8990	611.0565	583.7249	510.4736	412.9979	272.1207	155.6778	106.0279	(83)
Total gains	561.8740	680.4638	788.5944	911.9627	987.3523	980.8385	937.9508	865.8202	780.3093	653.7737	563.3780	531.2866	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	
alpha	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	
util living area	0.9907	0.9735	0.9271	0.8023	0.6197	0.4399	0.3176	0.3594	0.5860	0.8810	0.9779	0.9931	(86)
MIT	20.0771	20.3120	20.5962	20.8580	20.9703	20.9963	20.9995	20.9991	20.9833	20.7931	20.3724	20.0197	(87)
Th 2	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	(88)
util rest of house	0.9878	0.9660	0.9084	0.7627	0.5652	0.3784	0.2521	0.2886	0.5142	0.8439	0.9703	0.9909	(89)
MIT 2	19.0287	19.3230	19.6678	19.9599	20.0674	20.0873	20.0891	20.0889	20.0795	19.9009	19.4022	18.9560	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.4038	19.6768	19.9999	20.2812	20.3904	20.4125	20.4148	20.4145	20.4028	20.2201	19.7493	19.3365	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4038	19.6768	19.9999	20.2812	20.3904	20.4125	20.4148	20.4145	20.4028	20.2201	19.7493	19.3365	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9618	0.9063	0.7715	0.5835	0.4003	0.2755	0.3140	0.5394	0.8498	0.9668	0.9886	(94)
Useful gains	553.4615	654.4903	714.6957	703.5991	576.1610	392.6705	258.4428	271.8475	420.8760	555.5550	544.6694	525.2216	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1023.7221	1001.5605	915.0122	771.4071	589.0275	393.9667	258.5628	272.1000	427.1981	652.0411	857.3586	1025.9408	(97)
Space heating kWh	349.8739	233.2312	149.0355	48.8217	9.5727	0.0000	0.0000	0.0000	0.0000	71.7857	225.1362	372.5351	(98a)
Space heating requirement - total per year (kWh/year)												1459.9920	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	349.8739	233.2312	149.0355	48.8217	9.5727	0.0000	0.0000	0.0000	0.0000	71.7857	225.1362	372.5351	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1459.9920	
Space heating per m2											(98c) / (4) =	21.3887	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	349.8739	233.2312	149.0355	48.8217	9.5727	0.0000	0.0000	0.0000	0.0000	71.7857	225.1362	372.5351	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	349.8739	233.2312	149.0355	48.8217	9.5727	0.0000	0.0000	0.0000	0.0000	71.7857	225.1362	372.5351	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1459.9920	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												684.8345	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2349.0684	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1459.9920	0.1574	229.8756	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			326.5530	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			355.7832	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1459.9920	1.5828	2310.9290	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			3353.2503	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			3665.5944	(286)
Dwelling Primary energy Rate (DPER)			53.7000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1149	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3649	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3102	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3644	(22b)
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			15.0100	1.1450	17.1870			(27)
Brickwork	57.4800	15.0100	42.4700	0.1800	7.6446			(29a)
Communal Wall	6.3800	2.0600	4.3200	0.1800	0.7776			(29a)
Total net area of external elements Aum(A, m2)			63.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6692			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 252.3771 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.9400	0.0700	2.7958
E16 Corner (normal)	5.7600	0.0900	0.5184
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0900	-0.2592
E18 Party wall between dwellings	8.5500	0.0600	0.5130
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	32.8900	0.0500	1.6445
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.0200	0.0880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8300	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.7820 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.4512 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.2120	33.0376	32.8666	32.0636	31.9134	31.2140	31.2140	31.0845	31.4834	31.9134	32.2173	32.5350	(38)
Heat transfer coeff	66.6632	66.4888	66.3178	65.5148	65.3646	64.6652	64.6652	64.5357	64.9346	65.3646	65.6685	65.9863	(39)

Average = Sum(39)m / 12 = 65.5141

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9766	0.9741	0.9715	0.9598	0.9576	0.9473	0.9473	0.9454	0.9513	0.9576	0.9620	0.9667	(40)
HLP (average)												0.9598	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	244.2086	215.9707	229.2891	201.0606	194.5772	174.9630	172.3298	179.3233	181.4738	202.8156	216.2432	241.4563	(62)
WWHRS	-27.9594	-24.7276	-25.8933	-21.4407	-19.9819	-17.0987	-16.0273	-17.0434	-17.6909	-20.8557	-23.6270	-27.4417	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
									Total per year (kWh/year) = Sum(64)m =			2193.9237	(64)
12Total per year (kWh/year)												2194	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	102.9825	91.4853	98.0217	87.9331	86.4800	79.2556	79.0828	81.4081	81.4205	89.2193	92.9813	102.0673	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4835	107.9282	97.4835	100.7329	97.4835	100.7329	97.4835	97.4835	100.7329	97.4835	100.7329	97.4835	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	138.4173	136.1389	131.7496	122.1293	116.2366	110.0773	106.2940	109.4195	113.0840	119.9184	129.1407	137.1873	(72)

Total internal gains													
	488.1505	498.3216	478.4355	461.3092	438.5904	419.9203	404.3630	405.4837	417.4497	434.7901	460.8385	478.3958	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.9600	36.7938	0.6300	0.7000	0.7700	44.5289	(77)
West	11.0500	19.6403	0.6300	0.7000	0.7700	66.3256	(80)

Solar gains	110.8545	205.5962	317.4550	440.2207	525.9468	533.9482	510.0658	446.0588	360.8847	237.7853	136.0356	92.6504	(83)
Total gains	599.0050	703.9178	795.8906	901.5299	964.5372	953.8685	914.4288	851.5424	778.3344	672.5754	596.8741	571.0463	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.7840	71.9723	72.1578	73.0422	73.2101	74.0019	74.0019	74.1504	73.6949	73.2101	72.8713	72.5204	
alpha	5.7856	5.7982	5.8105	5.8695	5.8807	5.9335	5.9335	5.9434	5.9130	5.8807	5.8581	5.8347	
util living area													
	0.9870	0.9680	0.9207	0.7943	0.6141	0.4321	0.3109	0.3482	0.5661	0.8592	0.9696	0.9898	(86)
MIT	20.1599	20.3736	20.6314	20.8763	20.9749	20.9973	20.9997	20.9994	20.9880	20.8354	20.4610	20.1240	(87)
Th 2	20.1029	20.1050	20.1071	20.1170	20.1188	20.1275	20.1275	20.1290	20.1241	20.1188	20.1151	20.1112	(88)
util rest of house													
	0.9832	0.9593	0.9010	0.7550	0.5613	0.3740	0.2494	0.2825	0.4983	0.8194	0.9597	0.9867	(89)
MIT 2	19.1437	19.4115	19.7242	20.0046	20.1004	20.1261	20.1274	20.1289	20.1172	19.9715	19.5316	19.1049	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.5072	19.7557	20.0488	20.3164	20.4132	20.4378	20.4394	20.4403	20.4287	20.2806	19.8641	19.4695	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5072	19.7557	20.0488	20.3164	20.4132	20.4378	20.4394	20.4403	20.4287	20.2806	19.8641	19.4695	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9799	0.9552	0.8996	0.7643	0.5793	0.3948	0.2714	0.3060	0.5222	0.8274	0.9564	0.9839	(94)
Useful gains	586.9922	672.3938	715.9769	689.0407	558.7222	376.5666	248.1987	260.5836	406.4550	556.4563	570.8246	561.8505	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1013.7633	987.7385	898.5247	747.9459	569.5379	377.5002	248.2778	260.7430	410.9519	632.7669	838.1974	1007.5764	(97)
Space heating kWh													
	317.5177	211.9117	135.8155	42.4117	8.0469	0.0000	0.0000	0.0000	0.0000	56.7751	192.5084	331.6200	(98a)
Space heating requirement - total per year (kWh/year)												1296.6070	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	317.5177	211.9117	135.8155	42.4117	8.0469	0.0000	0.0000	0.0000	0.0000	56.7751	192.5084	331.6200	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1296.6070	
Space heating per m2										(98c) / (4) =		18.9951	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	317.5177	211.9117	135.8155	42.4117	8.0469	0.0000	0.0000	0.0000	0.0000	56.7751	192.5084	331.6200	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	344.0062	229.5901	147.1458	45.9499	8.7182	0.0000	0.0000	0.0000	0.0000	61.5115	208.5681	359.2850	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9198	84.2905	83.1752	81.3754	80.1579	79.8000	79.8000	79.8000	79.8000	81.7709	84.0585	85.0382	(217)
Fuel for water heating, kWh/month													
	254.6510	226.8859	244.5389	220.7299	217.8141	197.8249	195.8678	203.3583	205.2416	222.5240	229.1454	251.6687	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.2551	16.2494	14.6308	10.7192	8.2798	6.7647	7.5531	9.8178	12.7524	16.7318	18.8985	20.8181	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3097	-27.1386	-40.9912	-48.5120	-54.4468	-51.6084	-50.9824	-47.0686	-40.5400	-32.0903	-20.5958	-15.6793	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.6768	-14.3472	-29.0843	-44.5269	-59.7069	-60.2924	-59.5798	-50.0617	-36.1942	-20.7887	-9.0010	-5.2574	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1404.7746	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2670.2507	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	163.4706	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-843.4804	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3481.0155	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1404.7746	0.2100	295.0027	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2670.2507	0.2100	560.7527	(264)
Space and water heating			855.7553	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.4706	0.1443	23.5939	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9631	0.1335	-59.8221	
PV Unit electricity exported	-395.5173	0.1253	-49.5743	
Total			-109.3964	(269)
Total CO2, kg/year			781.8820	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1404.7746	1.1300	1587.3953	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2670.2507	1.1300	3017.3833	(278)
Space and water heating			4604.7786	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.4706	1.5338	250.7367	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9631	1.4935	-669.0288	
PV Unit electricity exported	-395.5173	0.4601	-181.9614	
Total			-850.9903	(283)
Total Primary energy kWh/year			4134.6258	(286)
Target Primary Energy Rate (TPER)			60.5700	(287)

Full SAP Calculation Printout

Plot Reference	P-39	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-39
Plot Address	Flat 6, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.21	**TER**	11.45
Environmental	96 A	**% DER < TER**			54.50
CO_2 Emissions (t/year)	0.3	**DFEE**	29.59	**TFEE**	27.13
Compliance Check	See BREL	**% DFEE < TFEE**			-9.06
% DPER < TPER	11.34	**DPER**	53.70	**TPER**	60.57

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8300	(17)
Infiltration rate		0.1915	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1628	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2075	0.2035	0.1994	0.1791	0.1750	0.1546	0.1546	0.1506	0.1628	0.1750	0.1831	0.1913	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	57.4800	20.6600	36.8200	0.2100	7.7322	110.0000	4050.1999	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2000	0.8640	110.0000	475.2000	(29a)
Total net area of external elements Aum(A, m2)			63.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.7247			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			165.9400			9.0000	1493.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17227.2600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		252.3771 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	39.9400	0.0380	1.5177	
E16 Corner (normal)	5.7600	0.0540	0.3110	
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794	
E18 Party wall between dwellings	8.5500	0.0380	0.3249	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815	
E4 Jamb	32.8900	0.0160	0.5262	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8300	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.3340	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	39.0587	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	(39)
Average = Sum(39)m / 12 =												67.7791	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	(40)
HLP (average)												0.9930	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2032	(42)
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)
Average daily hot water use (litres/day)												114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)											Total = Sum(45)m =	1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
										Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	126.8606	235.2831	363.2959	503.7918	601.8990	611.0565	583.7249	510.4736	412.9979	272.1207	155.6778	106.0279	(83)

Total gains	620.6826	727.2854	839.6100	950.4564	1019.2784	1001.7888	958.5805	887.9959	805.4836	691.4700	607.6418	586.5263	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	
alpha	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	
util living area													
	0.9851	0.9648	0.9091	0.7817	0.6026	0.4309	0.3108	0.3505	0.5694	0.8590	0.9693	0.9889	(86)
MIT	20.1650	20.3750	20.6478	20.8762	20.9741	20.9967	20.9996	20.9992	20.9855	20.8220	20.4335	20.1037	(87)
Th 2	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	(88)
util rest of house													
	0.9807	0.9552	0.8873	0.7409	0.5489	0.3706	0.2467	0.2814	0.4989	0.8184	0.9593	0.9856	(89)
MIT 2	19.1393	19.4001	19.7267	19.9777	20.0703	20.0875	20.0891	20.0889	20.0808	19.9302	19.4768	19.0622	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.5062	19.7488	20.0562	20.2991	20.3937	20.4128	20.4148	20.4146	20.4045	20.2492	19.8190	19.4348	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5062	19.7488	20.0562	20.2991	20.3937	20.4128	20.4148	20.4146	20.4045	20.2492	19.8190	19.4348	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9772	0.9510	0.8864	0.7508	0.5671	0.3921	0.2696	0.3062	0.5237	0.8262	0.9557	0.9825	(94)
Useful gains	606.5467	691.6574	744.2471	713.5836	578.0678	392.8190	258.4579	271.8834	421.8478	571.2985	580.6937	576.2508	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1030.6661	1006.4417	918.8301	772.6225	589.2483	393.9840	258.5647	272.1044	427.3110	654.0161	862.0859	1032.6011	(97)
Space heating kWh													
	315.5448	211.5350	129.8897	42.5080	8.3183	0.0000	0.0000	0.0000	0.0000	61.5419	202.6024	339.5246	(98a)
Space heating requirement - total per year (kWh/year)												1311.4648	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	315.5448	211.5350	129.8897	42.5080	8.3183	0.0000	0.0000	0.0000	0.0000	61.5419	202.6024	339.5246	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1311.4648	
Space heating per m2											(98c) / (4) =	19.2128	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	315.5448	211.5350	129.8897	42.5080	8.3183	0.0000	0.0000	0.0000	0.0000	61.5419	202.6024	339.5246	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	315.5448	211.5350	129.8897	42.5080	8.3183	0.0000	0.0000	0.0000	0.0000	61.5419	202.6024	339.5246	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1311.4648	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												684.8345	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)

mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2200.5412	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1311.4648	16.4900	216.2605	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	16.4900	112.9292	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	16.4900	7.2837	(249)
Energy for lighting	160.0718	16.4900	26.3958	(250)
Additional standing charges			0.0000	(251)
Total energy cost			362.8693	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1534	(257)
SAP value		81.3036	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1311.4648	0.1576	206.6344	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			303.3117	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			332.5420	(272)
CO2 emissions per m2			4.8700	(273)
EI value			96.0656	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8300	(17)
Infiltration rate		0.1915	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1628 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1750	0.1668	0.1668	0.1546	0.1587	0.1384	0.1384	0.1343	0.1384	0.1546	0.1506	0.1628	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	57.4800	20.6600	36.8200	0.2100	7.7322	110.0000	4050.1999	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2000	0.8640	110.0000	475.2000	(29a)
Total net area of external elements Aum(A, m2)			63.8600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.7247			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			165.9400			9.0000	1493.4600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17227.2600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 252.3771 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	39.9400	0.0380	1.5177
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.5500	0.0380	0.3249
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	32.8900	0.0160	0.5262
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8300	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.3340 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0587 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	(39)

Average = Sum(39)m / 12 = 67.7791

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	(40)
HLP (average)												0.9930	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)
Hot water usage for mixer showers

61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)

Total per year (kWh/year) = Sum(64)m = 2222.4248 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)

Water heating gains (Table 5)

	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)

Total internal gains

	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
West	9.7900	23.8018	0.3300	0.0000	0.7700	59.2102	(80)

Solar gains	151.6209	245.9086	377.2560	531.5544	619.1745	665.1693	629.0452	563.6716	457.3217	305.3569	183.3342	127.4244	(83)
Total gains	645.4429	737.9108	853.5701	978.2190	1036.5540	1055.9015	1003.9007	941.1939	849.8075	724.7062	635.2982	607.9229	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	
alpha	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	
util living area	0.9778	0.9539	0.8816	0.7212	0.5229	0.3334	0.2228	0.2448	0.4748	0.7963	0.9514	0.9830	(86)
MIT	20.2836	20.4656	20.7284	20.9248	20.9888	20.9993	20.9999	20.9999	20.9949	20.8928	20.5561	20.2298	(87)
Th 2	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	(88)
util rest of house	0.9712	0.9414	0.8541	0.6745	0.4667	0.2752	0.1613	0.1792	0.4045	0.7445	0.9358	0.9779	(89)
MIT 2	19.2883	19.5116	19.8195	20.0257	20.0820	20.0889	20.0892	20.0892	20.0867	20.0015	19.6262	19.2215	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.6443	19.8529	20.1446	20.3474	20.4064	20.4146	20.4150	20.4150	20.4116	20.3204	19.9589	19.5823	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6443	19.8529	20.1446	20.3474	20.4064	20.4146	20.4150	20.4150	20.4116	20.3204	19.9589	19.5823	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9376	0.8559	0.6882	0.4865	0.2960	0.1833	0.2027	0.4296	0.7585	0.9331	0.9742	(94)
Useful gains	624.3336	691.8874	730.5949	673.1870	504.2775	312.5617	184.0123	190.7815	365.0651	549.6956	592.8035	592.2647	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	985.8022	959.2703	863.8202	708.1138	508.7785	312.7742	184.0216	190.7983	366.7958	597.8361	810.5636	981.5946	(97)
Space heating kWh	268.9327	179.6813	99.1196	25.1473	3.3488	0.0000	0.0000	0.0000	0.0000	35.8165	156.7873	289.6615	(98a)
Space heating requirement - total per year (kWh/year)												1058.4948	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	268.9327	179.6813	99.1196	25.1473	3.3488	0.0000	0.0000	0.0000	0.0000	35.8165	156.7873	289.6615	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1058.4948	
Space heating per m2											(98c) / (4) =	15.5068	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	268.9327	179.6813	99.1196	25.1473	3.3488	0.0000	0.0000	0.0000	0.0000	35.8165	156.7873	289.6615	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	268.9327	179.6813	99.1196	25.1473	3.3488	0.0000	0.0000	0.0000	0.0000	35.8165	156.7873	289.6615	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement												
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128 (64)
Efficiency of water heater												324.5200 (216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200 (217)
Fuel for water heating, kWh/month												
	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514 (231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1058.4948 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	684.8345 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)	
mechanical ventilation fans (SFP = 0.2080)	44.1702 (230a)
Total electricity for the above, kWh/year	44.1702 (231)
Electricity for lighting (calculated in Appendix L)	160.0718 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1947.5713 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1058.4948	27.6700	292.8855	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	27.6700	189.4937	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	27.6700	12.2219	(249)
Energy for lighting	160.0718	27.6700	44.2919	(250)
Additional standing charges			0.0000	(251)
Total energy cost			538.8930	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1058.4948	0.1583	167.5492	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			264.2265	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			293.4568	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1058.4948	1.5859	1678.6964	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			2721.0178	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			3033.3619	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£539	£539	£0
Space heating	£305	£305	£0
Water heating	£189	£189	£0
Lighting	£44	£44	£0
Total cost of fuels	£539	£539	£0
Total cost of uses	£538	£538	£0
Delivered energy	29 kWh/m²	29 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	44 kWh/m²	44 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8300	(17)
Infiltration rate		0.1915	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1628	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2075	0.2035	0.1994	0.1791	0.1750	0.1546	0.1546	0.1506	0.1628	0.1750	0.1831	0.1913	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	57.4800	20.6600	36.8200	0.2100	7.7322	110.0000	4050.1999	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2000	0.8640	110.0000	475.2000	(29a)
Total net area of external elements Aum(A, m2)			63.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.7247			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			165.9400			9.0000	1493.4600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17227.2600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 252.3771 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.9400	0.0380	1.5177
E16 Corner (normal)	5.7600	0.0540	0.3110
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794
E18 Party wall between dwellings	8.5500	0.0380	0.3249
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	32.8900	0.0160	0.5262
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8300	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.3340 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0587 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	(39)
Average = Sum(39)m / 12 =												67.7791	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	(40)
HLP (average)												0.9930	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)
Hot water usage for mixer showers

61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
									Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260		(71)

Water heating gains (Table 5)

	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852 (72)
Total internal gains												
	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	126.8606	235.2831	363.2959	503.7918	601.8990	611.0565	583.7249	510.4736	412.9979	272.1207	155.6778	106.0279	(83)
Total gains	620.6826	727.2854	839.6100	950.4564	1019.2784	1001.7888	958.5805	887.9959	805.4836	691.4700	607.6418	586.5263	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	
alpha	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	
util living area	0.9851	0.9648	0.9091	0.7817	0.6026	0.4309	0.3108	0.3505	0.5694	0.8590	0.9693	0.9889	(86)
MIT	20.1650	20.3750	20.6478	20.8762	20.9741	20.9967	20.9996	20.9992	20.9855	20.8220	20.4335	20.1037	(87)
Th 2	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	(88)
util rest of house	0.9807	0.9552	0.8873	0.7409	0.5489	0.3706	0.2467	0.2814	0.4989	0.8184	0.9593	0.9856	(89)
MIT 2	19.1393	19.4001	19.7267	19.9777	20.0703	20.0875	20.0891	20.0889	20.0808	19.9302	19.4768	19.0622	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.5062	19.7488	20.0562	20.2991	20.3937	20.4128	20.4148	20.4146	20.4045	20.2492	19.8190	19.4348	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5062	19.7488	20.0562	20.2991	20.3937	20.4128	20.4148	20.4146	20.4045	20.2492	19.8190	19.4348	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9772	0.9510	0.8864	0.7508	0.5671	0.3921	0.2696	0.3062	0.5237	0.8262	0.9557	0.9825	(94)
Useful gains	606.5467	691.6574	744.2471	713.5836	578.0678	392.8190	258.4579	271.8834	421.8478	571.2985	580.6937	576.2508	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1030.6661	1006.4417	918.8301	772.6225	589.2483	393.9840	258.5647	272.1044	427.3110	654.0161	862.0859	1032.6011	(97)
Space heating kWh	315.5448	211.5350	129.8897	42.5080	8.3183	0.0000	0.0000	0.0000	0.0000	61.5419	202.6024	339.5246	(98a)
Space heating requirement - total per year (kWh/year)												1311.4648	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	315.5448	211.5350	129.8897	42.5080	8.3183	0.0000	0.0000	0.0000	0.0000	61.5419	202.6024	339.5246	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1311.4648	
Space heating per m2											(98c) / (4) =	19.2128	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	315.5448	211.5350	129.8897	42.5080	8.3183	0.0000	0.0000	0.0000	0.0000	61.5419	202.6024	339.5246	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	315.5448	211.5350	129.8897	42.5080	8.3183	0.0000	0.0000	0.0000	0.0000	61.5419	202.6024	339.5246	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1311.4648	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	684.8345	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2200.5412	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1311.4648	16.4900	216.2605	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	16.4900	112.9292	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	16.4900	7.2837	(249)
Energy for lighting	160.0718	16.4900	26.3958	(250)
Additional standing charges			0.0000	(251)
Total energy cost			362.8693	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1534	(257)
SAP value		81.3036	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1311.4648	0.1576	206.6344	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			303.3117	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			332.5420	(272)
CO2 emissions per m2			4.8700	(273)
EI value			96.0656	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8300	(17)
Infiltration rate		0.1915	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1628	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1750	0.1668	0.1668	0.1546	0.1587	0.1384	0.1384	0.1343	0.1384	0.1546	0.1506	0.1628	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	57.4800	20.6600	36.8200	0.2100	7.7322	110.0000	4050.1999	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2000	0.8640	110.0000	475.2000	(29a)
Total net area of external elements Aum(A, m2)			63.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.7247			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			165.9400			9.0000	1493.4600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17227.2600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		252.3771 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	39.9400	0.0380	1.5177	
E16 Corner (normal)	5.7600	0.0540	0.3110	
E17 Corner (inverted - internal area greater than external area)	2.8800	-0.0970	-0.2794	
E18 Party wall between dwellings	8.5500	0.0380	0.3249	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815	
E4 Jamb	32.8900	0.0160	0.5262	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.4000	0.3300	1.4520	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8300	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.3340 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.0587 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	67.7791	(39)
Average = Sum(39)m / 12 =												67.7791	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	0.9930	(40)
HLP (average)												0.9930	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2032	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)
Average daily hot water use (litres/day)												114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)

Water storage loss (or HIU loss):	
Store volume	200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
										Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)													
	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains													
	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
West	9.7900	23.8018	0.3300	0.0000	0.7700	59.2102	(80)

Solar gains	151.6209	245.9086	377.2560	531.5544	619.1745	665.1693	629.0452	563.6716	457.3217	305.3569	183.3342	127.4244	(83)
Total gains	645.4429	737.9108	853.5701	978.2190	1036.5540	1055.9015	1003.9007	941.1939	849.8075	724.7062	635.2982	607.9229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	70.6021	
alpha	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	5.7068	
util living area													
	0.9778	0.9539	0.8816	0.7212	0.5229	0.3334	0.2228	0.2448	0.4748	0.7963	0.9514	0.9830	(86)
MIT	20.2836	20.4656	20.7284	20.9248	20.9888	20.9993	20.9999	20.9999	20.9949	20.8928	20.5561	20.2298	(87)
Th 2	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	20.0892	(88)
util rest of house													
	0.9712	0.9414	0.8541	0.6745	0.4667	0.2752	0.1613	0.1792	0.4045	0.7445	0.9358	0.9779	(89)
MIT 2	19.2883	19.5116	19.8195	20.0257	20.0820	20.0889	20.0892	20.0892	20.0867	20.0015	19.6262	19.2215	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.6443	19.8529	20.1446	20.3474	20.4064	20.4146	20.4150	20.4150	20.4116	20.3204	19.9589	19.5823	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6443	19.8529	20.1446	20.3474	20.4064	20.4146	20.4150	20.4150	20.4116	20.3204	19.9589	19.5823	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9376	0.8559	0.6882	0.4865	0.2960	0.1833	0.2027	0.4296	0.7585	0.9331	0.9742	(94)
Useful gains	624.3336	691.8874	730.5949	673.1870	504.2775	312.5617	184.0123	190.7815	365.0651	549.6956	592.8035	592.2647	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	985.8022	959.2703	863.8202	708.1138	508.7785	312.7742	184.0216	190.7983	366.7958	597.8361	810.5636	981.5946	(97)
Space heating kWh													
	268.9327	179.6813	99.1196	25.1473	3.3488	0.0000	0.0000	0.0000	0.0000	35.8165	156.7873	289.6615	(98a)
Space heating requirement - total per year (kWh/year)												1058.4948	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	268.9327	179.6813	99.1196	25.1473	3.3488	0.0000	0.0000	0.0000	0.0000	35.8165	156.7873	289.6615	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1058.4948	
Space heating per m2											(98c) / (4) =	15.5068	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	268.9327	179.6813	99.1196	25.1473	3.3488	0.0000	0.0000	0.0000	0.0000	35.8165	156.7873	289.6615	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	268.9327	179.6813	99.1196	25.1473	3.3488	0.0000	0.0000	0.0000	0.0000	35.8165	156.7873	289.6615	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1058.4948	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												684.8345	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)													
mechanical ventilation fans (SFP = 0.2080)												44.1702	(230a)
Total electricity for the above, kWh/year												44.1702	(231)
Electricity for lighting (calculated in Appendix L)												160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1947.5713	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1058.4948	27.6700	292.8855	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	27.6700	189.4937	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	27.6700	12.2219	(249)
Energy for lighting	160.0718	27.6700	44.2919	(250)
Additional standing charges			0.0000	(251)
Total energy cost			538.8930	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1058.4948	0.1583	167.5492	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			264.2265	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			293.4568	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1058.4948	1.5859	1678.6964	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			2721.0178	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			3033.3619	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-40	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-40
Plot Address	Flat 7, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	80 C	**DER**	6.37	**TER**	14.43
Environmental	96 A	**% DER < TER**			55.86
CO_2 Emissions (t/year)	0.28	**DFEE**	35.49	**TFEE**	34.49
Compliance Check	See BREL	**% DFEE < TFEE**			-2.90
% DPER < TPER	14.54	**DPER**	65.67	**TPER**	76.84

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	25.82 m	52.47 m²	2.55 m

8.0 Living Area	23.74	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	40.83	28.34	0.00	None	12.49	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	27.47	25.41	0.90	Stairwell Access Corridor 4	2.06	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.04	6.04	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	14.69	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	106.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	52.47

11.1 Party Floors

Summary for Input Data

elmhurst energy

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	52.47

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Patio Door	Brickwork	North West	5.42	
West	Window	Brickwork	West	7.07	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	47.87	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	8.64	0.05	0.05	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	2.88	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	10.20	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	6.23	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.60	0.02	0.02	RCD	Yes
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	3.77	0.33	0.33	AbbeyCalculated	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	6.30	-0.10	-0.10	RCD	No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa

Summary for Input Data

elmhurst energy

Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.84	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day
34.0 Small-scale Hydro	None	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-40	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-40
Plot Address	Flat 7, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	80 C	**DER**	6.37	**TER**	14.43
Environmental	96 A	**% DER < TER**			55.86
CO_2 Emissions (t/year)	0.28	**DFEE**	35.49	**TFEE**	34.49
Compliance Check	See BREL	**% DFEE < TFEE**			-2.90
% DPER < TPER	14.54	**DPER**	65.67	**TPER**	76.84

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8400	(17)
Infiltration rate		0.1920	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1632	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2081	0.2040	0.1999	0.1795	0.1754	0.1550	0.1550	0.1510	0.1632	0.1754	0.1836	0.1918	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.8300	12.4900	28.3400	0.2100	5.9514	110.0000	3117.4002	(29a)
Communal Wall	27.4700	2.0600	25.4100	0.2000	5.0820	110.0000	2795.0999	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			74.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.7733			(33)
Main dwelling								
Party Wall 1			14.6900	0.0000	0.0000	110.0000	1615.9000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			106.0000			9.0000	954.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14393.8001 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		274.3244 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.6400	0.0540	0.4666
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.6372 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.4105 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	(39)
Average = Sum(39)m / 12 =												54.4872	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	(40)
HLP (average)												1.0384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7629 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)	100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)											Total = Sum(45)m =	1675.1071	
Distribution loss (46)m = 0.15 x (45)m													
	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
										Total per year (kWh/year) = Sum(64)m =	1992.4381	(64)
12Total per year (kWh/year)											1992	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	358.2381	366.1326	349.9525	335.5235	316.9621	303.9820	291.2929	292.4466	302.2694	314.2488	335.7378	350.3773	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains 50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)

Total gains	409.0607	466.7849	520.6096	594.8937	645.9354	646.0823	614.7651	562.5539	503.9121	434.8039	399.2844	392.0828	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	
alpha	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	
util living area													
	0.9950	0.9885	0.9690	0.8950	0.7347	0.5331	0.3890	0.4434	0.7072	0.9417	0.9890	0.9961	(86)
MIT	20.0276	20.1959	20.4478	20.7547	20.9378	20.9917	20.9989	20.9977	20.9621	20.6961	20.2991	19.9852	(87)
Th 2	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	(88)
util rest of house													
	0.9933	0.9846	0.9587	0.8638	0.6755	0.4572	0.3057	0.3532	0.6256	0.9166	0.9845	0.9948	(89)
MIT 2	18.9301	19.1434	19.4577	19.8188	20.0049	20.0473	20.0511	20.0507	20.0290	19.7625	19.2759	18.8762	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.4267	19.6196	19.9057	20.2422	20.4270	20.4746	20.4799	20.4792	20.4512	20.1849	19.7388	19.3780	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4267	19.6196	19.9057	20.2422	20.4270	20.4746	20.4799	20.4792	20.4512	20.1849	19.7388	19.3780	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9918	0.9824	0.9567	0.8707	0.6998	0.4914	0.3435	0.3941	0.6613	0.9207	0.9827	0.9935	(94)
Useful gains	405.7126	458.5479	498.0922	517.9624	452.0264	317.4931	211.1496	221.6969	333.2550	400.3216	392.3621	389.5298	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	824.2105	802.0320	730.4384	618.0074	475.5095	320.0902	211.4072	222.2632	346.0579	522.2536	688.6554	827.0053	(97)
Space heating kWh													
	311.3624	230.8213	172.8656	72.0324	17.4714	0.0000	0.0000	0.0000	0.0000	90.7174	213.3311	325.4818	(98a)
Space heating requirement - total per year (kWh/year)												1434.0835	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	311.3624	230.8213	172.8656	72.0324	17.4714	0.0000	0.0000	0.0000	0.0000	90.7174	213.3311	325.4818	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1434.0835	
Space heating per m2											(98c) / (4) =	27.3315	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	311.3624	230.8213	172.8656	72.0324	17.4714	0.0000	0.0000	0.0000	0.0000	90.7174	213.3311	325.4818	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	311.3624	230.8213	172.8656	72.0324	17.4714	0.0000	0.0000	0.0000	0.0000	90.7174	213.3311	325.4818	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1434.0835	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 33.9527 (230a)
Total electricity for the above, kWh/year 33.9527 (231)
Electricity for lighting (calculated in Appendix L) 127.2974 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2209.2982 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1434.0835	0.1564	224.3429	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			310.9866	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			334.0692	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.3700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1434.0835	1.5791	2264.6254	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			3198.9739	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			3445.5906	(286)
Dwelling Primary energy Rate (DPER)			65.6700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3995	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)
Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0500	1.1450	12.6527			(27)
Brickwork	40.8300	11.0500	29.7800	0.1800	5.3604			(29a)
Communal Wall	27.4700	2.0600	25.4100	0.1800	4.5738			(29a)
Lift Shaft Wall	6.0400		6.0400	0.1800	1.0872			(29a)
Total net area of external elements Aum(A, m2)			74.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7341			(33)
Main dwelling								
Party Wall 1			14.6900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 274.3244 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0700	3.3509
E16 Corner (normal)	8.6400	0.0900	0.7776
E18 Party wall between dwellings	2.8800	0.0600	0.1728
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0500	0.9300
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.0200	0.0754
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0512 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.7853 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	56.9999	56.8392	56.6817	55.9420	55.8036	55.1593	55.1593	55.0400	55.4074	55.8036	56.0836	56.3763	(39)
Average = Sum(39)m / 12 =												55.9413	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0863	1.0833	1.0803	1.0662	1.0635	1.0513	1.0513	1.0490	1.0560	1.0635	1.0689	1.0744	(40)
HLP (average)												1.0662	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers												
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)
Hot water usage for baths												
23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)
Hot water usage for other uses												
32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)
Average daily hot water use (litres/day)												100.8506	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m													
	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	220.3518	194.9791	207.2344	182.2321	176.7131	159.2853	157.1511	163.3000	165.0091	183.9559	195.5810	217.9316	(62)
WWHRS	-24.5851	-21.7433	-22.7683	-18.8531	-17.5704	-15.0351	-14.0930	-14.9865	-15.5559	-18.3387	-20.7755	-24.1298	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
										Total per year (kWh/year) = Sum(64)m =		1995.2899	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.0501	84.5056	90.6886	81.6726	80.5402	74.0428	74.0358	76.0804	75.9460	82.9484	86.1111	94.2454	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.6934	86.0177	77.6934	80.2832	77.6934	80.2832	77.6934	77.6934	80.2832	77.6934	80.2832	77.6934	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	127.7555	125.7524	121.8932	113.4342	108.2530	102.8372	99.5106	102.2586	105.4805	111.4898	119.5988	126.6739	(72)
Total internal gains													

	411.5375	419.4531	403.2519	388.8294	370.2615	354.2880	341.5923	342.7459	352.5754	367.5482	389.0438	403.6767 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2500	19.6403	0.6300	0.7000	0.7700	37.5145	(80)
Northwest	4.8000	11.2829	0.6300	0.7000	0.7700	16.5514	(81)

Solar gains	54.0659	107.0772	181.5571	275.9498	350.0156	363.9885	344.1660	287.3781	214.5257	128.2520	67.6021	44.3668	(83)
Total gains	465.6034	526.5303	584.8090	664.7792	720.2771	718.2765	685.7583	630.1240	567.1011	495.8002	456.6459	448.0435	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.1453	70.3436	70.5391	71.4719	71.6491	72.4861	72.4861	72.6432	72.1614	71.6491	71.2914	70.9213	
alpha	5.6764	5.6896	5.7026	5.7648	5.7766	5.8324	5.8324	5.8429	5.8108	5.7766	5.7528	5.7281	
util living area													
	0.9911	0.9812	0.9539	0.8598	0.6865	0.4875	0.3534	0.4006	0.6503	0.9106	0.9804	0.9927	(86)
MIT	20.0595	20.2355	20.4931	20.7973	20.9528	20.9945	20.9993	20.9986	20.9739	20.7518	20.3616	20.0347	(87)
Th 2	20.0120	20.0145	20.0170	20.0286	20.0307	20.0408	20.0408	20.0427	20.0369	20.0307	20.0263	20.0218	(88)
util rest of house													
	0.9881	0.9752	0.9394	0.8228	0.6262	0.4163	0.2767	0.3179	0.5695	0.8766	0.9729	0.9903	(89)
MIT 2	18.9403	19.1635	19.4829	19.8420	19.9965	20.0382	20.0407	20.0423	20.0222	19.8043	19.3335	18.9163	(90)
Living area fraction									fLA = Living area / (4) =			0.4524	(91)
MIT	19.4467	19.6485	19.9399	20.2742	20.4292	20.4708	20.4744	20.4750	20.4528	20.2330	19.7987	19.4223	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4467	19.6485	19.9399	20.2742	20.4292	20.4708	20.4744	20.4750	20.4528	20.2330	19.7987	19.4223	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9859	0.9724	0.9380	0.8329	0.6517	0.4485	0.3114	0.3554	0.6054	0.8846	0.9707	0.9883	(94)
Useful gains	459.0529	511.9923	548.5665	553.6853	469.4049	322.1172	213.5445	223.9401	343.2986	438.5784	443.2729	442.8028	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	863.3592	838.2946	761.7988	636.2952	487.1205	323.8313	213.7084	224.2859	351.9915	537.5571	712.1885	858.1787	(97)
Space heating kWh													
	300.8038	219.2752	158.6448	59.4792	13.1804	0.0000	0.0000	0.0000	0.0000	73.6402	193.6192	309.0396	(98a)
Space heating requirement - total per year (kWh/year)												1327.6824	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	300.8038	219.2752	158.6448	59.4792	13.1804	0.0000	0.0000	0.0000	0.0000	73.6402	193.6192	309.0396	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1327.6824	
Space heating per m2											(98c) / (4) =	25.3036	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	300.8038	219.2752	158.6448	59.4792	13.1804	0.0000	0.0000	0.0000	0.0000	73.6402	193.6192	309.0396	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	325.8980	237.5679	171.8795	64.4412	14.2800	0.0000	0.0000	0.0000	0.0000	79.7835	209.7716	334.8208	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0198	84.5894	83.7234	82.0186	80.4234	79.8000	79.8000	79.8000	79.8000	82.3695	84.2896	85.1009	(217)
Fuel for water heating, kWh/month													
	230.2602	204.7961	220.3279	199.1976	197.8810	180.7647	179.2708	185.8566	187.2847	201.0662	207.3869	227.7318	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1432	12.9506	11.6606	8.5431	6.5989	5.3914	6.0197	7.8247	10.1635	13.3351	15.0619	16.5918	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1917	-21.0987	-31.9692	-37.9679	-42.7442	-40.5813	-40.1064	-36.9729	-31.7516	-25.0211	-15.9913	-12.1470	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0149	-10.7905	-21.8964	-33.5491	-45.0032	-45.4345	-44.8804	-37.6891	-27.2324	-15.6258	-6.7591	-3.9466	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1438.4425	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2421.8245	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.2845	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-648.3653	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3428.1861	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1438.4425	0.2100	302.0729	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2421.8245	0.2100	508.5831	(264)
Space and water heating			810.6561	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.2845	0.1443	18.8041	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5433	0.1335	-46.7857	
PV Unit electricity exported	-297.8220	0.1253	-37.3252	
Total			-84.1110	(269)
Total CO2, kg/year			757.2784	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1438.4425	1.1300	1625.4400	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2421.8245	1.1300	2736.6617	(278)
Space and water heating			4362.1017	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.2845	1.5338	199.8347	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5433	1.4932	-523.4330	
PV Unit electricity exported	-297.8220	0.4600	-137.0015	
Total			-660.4345	(283)
Total Primary energy kWh/year			4031.6027	(286)
Target Primary Energy Rate (TPER)			76.8400	(287)

Full SAP Calculation Printout

Plot Reference	P-40	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-40
Plot Address	Flat 7, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	80 C	**DER**	6.37	**TER**	14.43
Environmental	96 A	**% DER < TER**			55.86
CO_2 Emissions (t/year)	0.28	**DFEE**	35.49	**TFEE**	34.49
Compliance Check	See BREL	**% DFEE < TFEE**			-2.90
% DPER < TPER	14.54	**DPER**	65.67	**TPER**	76.84

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	133.7985	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8400	(17)
Infiltration rate		0.3415	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2903	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3701	0.3628	0.3556	0.3193	0.3120	0.2757	0.2757	0.2685	0.2903	0.3120	0.3265	0.3411	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5685	0.5658	0.5632	0.5510	0.5487	0.5380	0.5380	0.5360	0.5421	0.5487	0.5533	0.5582	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.8300	12.4900	28.3400	0.2100	5.9514	110.0000	3117.4002	(29a)
Communal Wall	27.4700	2.0600	25.4100	0.2000	5.0820	110.0000	2795.0999	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			74.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.7733			(33)
Main dwelling								
Party Wall 1			14.6900	0.0000	0.0000	110.0000	1615.9000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			106.0000			9.0000	954.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14393.8001	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							274.3244	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.6400	0.0540	0.4666
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.6372 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.4105 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.1003	24.9829	24.8678	24.3273	24.2261	23.7554	23.7554	23.6682	23.9367	24.2261	24.4307	24.6446	(38)
Heat transfer coeff	57.5108	57.3934	57.2783	56.7378	56.6366	56.1658	56.1658	56.0787	56.3472	56.6366	56.8412	57.0551	(39)
Average = Sum(39)m / 12 =												56.7373	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0961	1.0938	1.0916	1.0813	1.0794	1.0704	1.0704	1.0688	1.0739	1.0794	1.0833	1.0874	(40)
HLP (average)												1.0813	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 51.2690 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.9338	54.4000	52.7252	50.6402	48.7804	46.8475	46.4454	48.1167	49.8310	51.8160	53.9195	55.8552	(44)
Energy conte	88.5855	77.4649	81.0367	69.3239	65.6677	57.6044	56.1717	59.5786	61.4466	70.3138	76.8182	87.4557	(45)
Energy content (annual)										Total = Sum(45)m =		851.4677	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(64)
										Total per year (kWh/year) = Sum(64)m =		723.7475	(64)
12Total per year (kWh/year)												724	(64)
Electric shower(s)	43.0673	38.3733	41.9022	39.9868	40.7371	38.8592	40.1546	40.7371	39.9868	41.9022	41.1143	43.0673	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		489.8882	(64a)
Heat gains from water heating, kWh/month	29.5912	26.0546	27.6959	24.7280	24.1387	21.9557	21.9751	22.8447	23.0541	25.4172	26.6024	29.3512	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	39.7732	38.7718	37.2256	34.3445	32.4444	30.4941	29.5364	30.7053	32.0196	34.1630	36.9478	39.4505	(72)
Total internal gains	320.3579	329.2540	315.3870	306.5358	291.2556	281.7409	271.4208	270.9953	278.9105	287.0240	303.1890	313.2560	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)
Total gains	371.1805	429.9062	486.0441	565.9060	620.2289	623.8412	594.8931	541.1027	480.5532	407.5791	366.7355	354.9614	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	69.5222	69.6644	69.8044	70.4694	70.5953	71.1870	71.1870	71.2977	70.9579	70.5953	70.3412	70.0775	
alpha	5.6348	5.6443	5.6536	5.6980	5.7064	5.7458	5.7458	5.7532	5.7305	5.7064	5.6894	5.6718	
util living area	0.9971	0.9928	0.9794	0.9195	0.7736	0.5657	0.4139	0.4732	0.7487	0.9588	0.9932	0.9977	(86)
MIT	19.8698	20.0477	20.3207	20.6810	20.9099	20.9874	20.9982	20.9963	20.9442	20.6194	20.1829	19.8412	(87)
Th 2	20.0040	20.0059	20.0077	20.0161	20.0177	20.0250	20.0250	20.0264	20.0222	20.0177	20.0145	20.0111	(88)
util rest of house	0.9961	0.9903	0.9719	0.8927	0.7144	0.4843	0.3230	0.3750	0.6657	0.9392	0.9903	0.9969	(89)
MIT 2	18.9828	19.1608	19.4303	19.7752	19.9639	20.0201	20.0247	20.0255	19.9957	19.7285	19.3028	18.9600	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.3841	19.5621	19.8332	20.1850	20.3919	20.4578	20.4651	20.4648	20.4249	20.1316	19.7010	19.3587	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3841	19.5621	19.8332	20.1850	20.3919	20.4578	20.4651	20.4648	20.4249	20.1316	19.7010	19.3587	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9888	0.9703	0.8979	0.7381	0.5210	0.3642	0.4196	0.7017	0.9419	0.9891	0.9962	(94)
Useful gains	369.3974	425.1036	471.5972	508.0999	457.7820	325.0156	216.6680	227.0312	337.2188	383.8958	362.7202	353.6182	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	867.4983	841.5053	763.7028	640.2878	492.2805	329.0055	217.0892	227.9465	356.3880	539.8384	716.2557	864.8801	(97)
Space heating kWh	370.5871	279.8220	217.3266	95.1753	25.6669	0.0000	0.0000	0.0000	0.0000	116.0213	254.5455	380.3788	(98a)
Space heating requirement - total per year (kWh/year)												1739.5235	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	370.5871	279.8220	217.3266	95.1753	25.6669	0.0000	0.0000	0.0000	0.0000	116.0213	254.5455	380.3788	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1739.5235	
Space heating per m2											(98c) / (4) =	33.1527	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	527.9589	415.6272	426.1978	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9433	0.9744	0.9573	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	498.0317	404.9900	408.0093	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	701.4083	669.1055	607.7169	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	146.4312	196.5019	148.5825	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.6078	49.1255	37.1456	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												122.8789	(107)
Energy for space heating												33.1527	(99)
Energy for space cooling												2.3419	(108)
Total												35.4946	(109)
Fabric Energy Efficiency (DFEE)												35.5	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	133.7985	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495 (8)
Pressure test		Yes

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3995	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5937 0.5901 0.5865 0.5698 0.5666 0.5520 0.5520 0.5493 0.5576 0.5666 0.5730 0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0500	1.1450	12.6527			(27)
Brickwork	40.8300	11.0500	29.7800	0.1800	5.3604			(29a)
Communal Wall	27.4700	2.0600	25.4100	0.1800	4.5738			(29a)
Lift Shaft Wall	6.0400		6.0400	0.1800	1.0872			(29a)
Total net area of external elements Aum(A, m2)			74.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7341			(33)
Main dwelling								
Party Wall 1			14.6900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	274.3244 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0700	3.3509
E16 Corner (normal)	8.6400	0.0900	0.7776
E18 Party wall between dwellings	2.8800	0.0600	0.1728
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0500	0.9300
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.0200	0.0754
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.0512	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	30.7853	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	56.9999	56.8392	56.6817	55.9420	55.8036	55.1593	55.1593	55.0400	55.4074	55.8036	56.0836	56.3763	(39)
Average = Sum(39)m / 12 =												55.9413	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0863	1.0833	1.0803	1.0662	1.0635	1.0513	1.0513	1.0490	1.0560	1.0635	1.0689	1.0744	(40)
HLP (average)												1.0662	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7629	(42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)	51.2690	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.9338	54.4000	52.7252	50.6402	48.7804	46.8475	46.4454	48.1167	49.8310	51.8160	53.9195	55.8552	(44)
Energy conte	88.5855	77.4649	81.0367	69.3239	65.6677	57.6044	56.1717	59.5786	61.4466	70.3138	76.8182	87.4557	(45)
Energy content (annual)										Total = Sum(45)m =		851.4677	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(64)
										Total per year (kWh/year) = Sum(64)m =		723.7475	(64)
12Total per year (kWh/year)												724	(64)

Electric shower(s)

43.0673	38.3733	41.9022	39.9868	40.7371	38.8592	40.1546	40.7371	39.9868	41.9022	41.1143	43.0673	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	489.8882	(64a)

Heat gains from water heating, kWh/month

29.5912	26.0546	27.6959	24.7280	24.1387	21.9557	21.9751	22.8447	23.0541	25.4172	26.6024	29.3512	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	77.6934	86.0177	77.6934	80.2832	77.6934	80.2832	77.6934	77.6934	80.2832	77.6934	80.2832	77.6934	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)

Water heating gains (Table 5)

	39.7732	38.7718	37.2256	34.3445	32.4444	30.4941	29.5364	30.7053	32.0196	34.1630	36.9478	39.4505	(72)

Total internal gains

	320.5552	329.4724	315.5843	306.7397	291.4530	281.9448	271.6182	271.1926	279.1144	287.2213	303.3929	313.4533	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2500	19.6403	0.6300	0.7000	0.7700	37.5145	(80)
Northwest	4.8000	11.2829	0.6300	0.7000	0.7700	16.5514	(81)

Solar gains	54.0659	107.0772	181.5571	275.9498	350.0156	363.9885	344.1660	287.3781	214.5257	128.2520	67.6021	44.3668	(83)
Total gains	374.6211	436.5497	497.1414	582.6895	641.4685	645.9333	615.7842	558.5707	493.6402	415.4733	370.9950	357.8202	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.1453	70.3436	70.5391	71.4719	71.6491	72.4861	72.4861	72.6432	72.1614	71.6491	71.2914	70.9213	
alpha	5.6764	5.6896	5.7026	5.7648	5.7766	5.8324	5.8324	5.8429	5.8108	5.7766	5.7528	5.7281	
util living area	0.9969	0.9922	0.9767	0.9079	0.7494	0.5391	0.3931	0.4508	0.7265	0.9540	0.9926	0.9976	(86)
MIT	19.8907	20.0752	20.3544	20.7155	20.9264	20.9907	20.9988	20.9974	20.9543	20.6458	20.2089	19.8659	(87)
Th 2	20.0120	20.0145	20.0170	20.0286	20.0307	20.0408	20.0408	20.0427	20.0369	20.0307	20.0263	20.0218	(88)
util rest of house	0.9959	0.9894	0.9685	0.8788	0.6897	0.4618	0.3080	0.3584	0.6439	0.9327	0.9895	0.9968	(89)
MIT 2	19.0100	19.1949	19.4704	19.8160	19.9875	20.0373	20.0406	20.0421	20.0156	19.7636	19.3380	18.9931	(90)
Living area fraction									fLA = Living area / (4) =			0.4524	(91)
MIT	19.4085	19.5932	19.8704	20.2230	20.4123	20.4687	20.4741	20.4743	20.4403	20.1627	19.7320	19.3880	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4085	19.5932	19.8704	20.2230	20.4123	20.4687	20.4741	20.4743	20.4403	20.1627	19.7320	19.3880	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9950	0.9879	0.9670	0.8853	0.7142	0.4967	0.3466	0.4003	0.6801	0.9361	0.9883	0.9961	(94)
Useful gains	372.7362	431.2825	480.7203	515.8498	458.1612	320.8135	213.4015	223.5996	335.7331	388.9372	366.6636	356.4098	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	861.1814	835.1505	757.8554	633.4285	486.1772	323.7116	213.6927	224.2495	351.3015	533.6347	708.4501	856.2441	(97)
Space heating kWh	363.4032	271.3993	206.1885	84.6567	20.8439	0.0000	0.0000	0.0000	0.0000	107.6549	246.0862	371.8767	(98a)
Space heating requirement - total per year (kWh/year)												1672.1096	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	363.4032	271.3993	206.1885	84.6567	20.8439	0.0000	0.0000	0.0000	0.0000	107.6549	246.0862	371.8767	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1672.1096	
Space heating per m2											(98c) / (4) =	31.8679	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	518.4971	408.1786	418.3036	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9557	0.9808	0.9668	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	495.5034	400.3289	404.4342	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	727.0092	693.3117	627.9278	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	166.6842	217.9792	166.2792	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.6710	54.4948	41.5698	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												137.7356	(107)
Energy for space heating												31.8679	(99)
Energy for space cooling												2.6250	(108)
Total												34.4930	(109)
Fabric Energy Efficiency (TFEE)												34.5	(109)

Full SAP Calculation Printout

Plot Reference	P-40	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-40
Plot Address	Flat 7, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	80 C	**DER**	6.37	**TER**	14.43
Environmental	96 A	**% DER < TER**			55.86
CO_2 Emissions (t/year)	0.28	**DFEE**	35.49	**TFEE**	34.49
Compliance Check	See BREL	**% DFEE < TFEE**			-2.90
% DPER < TPER	14.54	**DPER**	65.67	**TPER**	76.84

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8400	(17)
Infiltration rate		0.1920	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1632	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2081	0.2040	0.1999	0.1795	0.1754	0.1550	0.1550	0.1510	0.1632	0.1754	0.1836	0.1918	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.8300	12.4900	28.3400	0.2100	5.9514	110.0000	3117.4002	(29a)
Communal Wall	27.4700	2.0600	25.4100	0.2000	5.0820	110.0000	2795.0999	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			74.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.7733			(33)
Main dwelling								
Party Wall 1			14.6900	0.0000	0.0000	110.0000	1615.9000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			106.0000			9.0000	954.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14393.8001 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		274.3244 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.6400	0.0540	0.4666
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.6372 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.4105 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	(39)
Average = Sum(39)m / 12 =												54.4872	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	(40)
HLP (average)												1.0384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7629 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)	100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)											Total = Sum(45)m =	1675.1071	
Distribution loss (46)m = 0.15 x (45)m													
	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):	
Store volume	200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
										Total per year (kWh/year) = Sum(64)m =	1992.4381	(64)
12Total per year (kWh/year)											1992	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	358.2381	366.1326	349.9525	335.5235	316.9621	303.9820	291.2929	292.4466	302.2694	314.2488	335.7378	350.3773	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains 50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)

Total gains	409.0607	466.7849	520.6096	594.8937	645.9354	646.0823	614.7651	562.5539	503.9121	434.8039	399.2844	392.0828	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	
alpha	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	
util living area													
	0.9950	0.9885	0.9690	0.8950	0.7347	0.5331	0.3890	0.4434	0.7072	0.9417	0.9890	0.9961	(86)
MIT	20.0276	20.1959	20.4478	20.7547	20.9378	20.9917	20.9989	20.9977	20.9621	20.6961	20.2991	19.9852	(87)
Th 2	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	(88)
util rest of house													
	0.9933	0.9846	0.9587	0.8638	0.6755	0.4572	0.3057	0.3532	0.6256	0.9166	0.9845	0.9948	(89)
MIT 2	18.9301	19.1434	19.4577	19.8188	20.0049	20.0473	20.0511	20.0507	20.0290	19.7625	19.2759	18.8762	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.4267	19.6196	19.9057	20.2422	20.4270	20.4746	20.4799	20.4792	20.4512	20.1849	19.7388	19.3780	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4267	19.6196	19.9057	20.2422	20.4270	20.4746	20.4799	20.4792	20.4512	20.1849	19.7388	19.3780	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9918	0.9824	0.9567	0.8707	0.6998	0.4914	0.3435	0.3941	0.6613	0.9207	0.9827	0.9935	(94)
Useful gains	405.7126	458.5479	498.0922	517.9624	452.0264	317.4931	211.1496	221.6969	333.2550	400.3216	392.3621	389.5298	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	824.2105	802.0320	730.4384	618.0074	475.5095	320.0902	211.4072	222.2632	346.0579	522.2536	688.6554	827.0053	(97)
Space heating kWh													
	311.3624	230.8213	172.8656	72.0324	17.4714	0.0000	0.0000	0.0000	0.0000	90.7174	213.3311	325.4818	(98a)
Space heating requirement - total per year (kWh/year)												1434.0835	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	311.3624	230.8213	172.8656	72.0324	17.4714	0.0000	0.0000	0.0000	0.0000	90.7174	213.3311	325.4818	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1434.0835	
Space heating per m2											(98c) / (4) =	27.3315	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	311.3624	230.8213	172.8656	72.0324	17.4714	0.0000	0.0000	0.0000	0.0000	90.7174	213.3311	325.4818	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	311.3624	230.8213	172.8656	72.0324	17.4714	0.0000	0.0000	0.0000	0.0000	90.7174	213.3311	325.4818	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1434.0835	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 33.9527 (230a)
Total electricity for the above, kWh/year 33.9527 (231)
Electricity for lighting (calculated in Appendix L) 127.2974 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2209.2982 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1434.0835	0.1564	224.3429	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			310.9866	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			334.0692	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.3700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1434.0835	1.5791	2264.6254	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			3198.9739	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			3445.5906	(286)
Dwelling Primary energy Rate (DPER)			65.6700	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3995	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)
Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0500	1.1450	12.6527			(27)
Brickwork	40.8300	11.0500	29.7800	0.1800	5.3604			(29a)
Communal Wall	27.4700	2.0600	25.4100	0.1800	4.5738			(29a)
Lift Shaft Wall	6.0400		6.0400	0.1800	1.0872			(29a)
Total net area of external elements Aum(A, m2)			74.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7341			(33)
Main dwelling								
Party Wall 1			14.6900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 274.3244 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0700	3.3509
E16 Corner (normal)	8.6400	0.0900	0.7776
E18 Party wall between dwellings	2.8800	0.0600	0.1728
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0500	0.9300
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.0200	0.0754
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0512 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.7853 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	56.9999	56.8392	56.6817	55.9420	55.8036	55.1593	55.1593	55.0400	55.4074	55.8036	56.0836	56.3763	(39)
Average = Sum(39)m / 12 =												55.9413	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0863	1.0833	1.0803	1.0662	1.0635	1.0513	1.0513	1.0490	1.0560	1.0635	1.0689	1.0744	(40)
HLP (average)												1.0662	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers												
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)
Hot water usage for baths												
23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)
Hot water usage for other uses												
32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)
Average daily hot water use (litres/day)												100.8506	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m													
	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	220.3518	194.9791	207.2344	182.2321	176.7131	159.2853	157.1511	163.3000	165.0091	183.9559	195.5810	217.9316	(62)
WWHRS	-24.5851	-21.7433	-22.7683	-18.8531	-17.5704	-15.0351	-14.0930	-14.9865	-15.5559	-18.3387	-20.7755	-24.1298	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
										Total per year (kWh/year) = Sum(64)m =		1995.2899	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.0501	84.5056	90.6886	81.6726	80.5402	74.0428	74.0358	76.0804	75.9460	82.9484	86.1111	94.2454	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.6934	86.0177	77.6934	80.2832	77.6934	80.2832	77.6934	77.6934	80.2832	77.6934	80.2832	77.6934	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	127.7555	125.7524	121.8932	113.4342	108.2530	102.8372	99.5106	102.2586	105.4805	111.4898	119.5988	126.6739	(72)
Total internal gains													

	411.5375	419.4531	403.2519	388.8294	370.2615	354.2880	341.5923	342.7459	352.5754	367.5482	389.0438	403.6767 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2500	19.6403	0.6300	0.7000	0.7700	37.5145	(80)
Northwest	4.8000	11.2829	0.6300	0.7000	0.7700	16.5514	(81)

Solar gains	54.0659	107.0772	181.5571	275.9498	350.0156	363.9885	344.1660	287.3781	214.5257	128.2520	67.6021	44.3668	(83)
Total gains	465.6034	526.5303	584.8090	664.7792	720.2771	718.2765	685.7583	630.1240	567.1011	495.8002	456.6459	448.0435	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.1453	70.3436	70.5391	71.4719	71.6491	72.4861	72.4861	72.6432	72.1614	71.6491	71.2914	70.9213	
alpha	5.6764	5.6896	5.7026	5.7648	5.7766	5.8324	5.8324	5.8429	5.8108	5.7766	5.7528	5.7281	
util living area													
	0.9911	0.9812	0.9539	0.8598	0.6865	0.4875	0.3534	0.4006	0.6503	0.9106	0.9804	0.9927	(86)
MIT	20.0595	20.2355	20.4931	20.7973	20.9528	20.9945	20.9993	20.9986	20.9739	20.7518	20.3616	20.0347	(87)
Th 2	20.0120	20.0145	20.0170	20.0286	20.0307	20.0408	20.0408	20.0427	20.0369	20.0307	20.0263	20.0218	(88)
util rest of house													
	0.9881	0.9752	0.9394	0.8228	0.6262	0.4163	0.2767	0.3179	0.5695	0.8766	0.9729	0.9903	(89)
MIT 2	18.9403	19.1635	19.4829	19.8420	19.9965	20.0382	20.0407	20.0423	20.0222	19.8043	19.3335	18.9163	(90)
Living area fraction									fLA = Living area / (4) =			0.4524	(91)
MIT	19.4467	19.6485	19.9399	20.2742	20.4292	20.4708	20.4744	20.4750	20.4528	20.2330	19.7987	19.4223	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4467	19.6485	19.9399	20.2742	20.4292	20.4708	20.4744	20.4750	20.4528	20.2330	19.7987	19.4223	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9859	0.9724	0.9380	0.8329	0.6517	0.4485	0.3114	0.3554	0.6054	0.8846	0.9707	0.9883	(94)
Useful gains	459.0529	511.9923	548.5665	553.6853	469.4049	322.1172	213.5445	223.9401	343.2986	438.5784	443.2729	442.8028	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	863.3592	838.2946	761.7988	636.2952	487.1205	323.8313	213.7084	224.2859	351.9915	537.5571	712.1885	858.1787	(97)
Space heating kWh													
	300.8038	219.2752	158.6448	59.4792	13.1804	0.0000	0.0000	0.0000	0.0000	73.6402	193.6192	309.0396	(98a)
Space heating requirement - total per year (kWh/year)												1327.6824	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	300.8038	219.2752	158.6448	59.4792	13.1804	0.0000	0.0000	0.0000	0.0000	73.6402	193.6192	309.0396	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1327.6824	
Space heating per m2											(98c) / (4) =	25.3036	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	300.8038	219.2752	158.6448	59.4792	13.1804	0.0000	0.0000	0.0000	0.0000	73.6402	193.6192	309.0396	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	325.8980	237.5679	171.8795	64.4412	14.2800	0.0000	0.0000	0.0000	0.0000	79.7835	209.7716	334.8208	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0198	84.5894	83.7234	82.0186	80.4234	79.8000	79.8000	79.8000	79.8000	82.3695	84.2896	85.1009	(217)
Fuel for water heating, kWh/month													
	230.2602	204.7961	220.3279	199.1976	197.8810	180.7647	179.2708	185.8566	187.2847	201.0662	207.3869	227.7318	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1432	12.9506	11.6606	8.5431	6.5989	5.3914	6.0197	7.8247	10.1635	13.3351	15.0619	16.5918	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1917	-21.0987	-31.9692	-37.9679	-42.7442	-40.5813	-40.1064	-36.9729	-31.7516	-25.0211	-15.9913	-12.1470	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0149	-10.7905	-21.8964	-33.5491	-45.0032	-45.4345	-44.8804	-37.6891	-27.2324	-15.6258	-6.7591	-3.9466	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1438.4425	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2421.8245	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.2845	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-648.3653	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3428.1861	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1438.4425	0.2100	302.0729	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2421.8245	0.2100	508.5831	(264)
Space and water heating			810.6561	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.2845	0.1443	18.8041	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5433	0.1335	-46.7857	
PV Unit electricity exported	-297.8220	0.1253	-37.3252	
Total			-84.1110	(269)
Total CO2, kg/year			757.2784	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1438.4425	1.1300	1625.4400	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2421.8245	1.1300	2736.6617	(278)
Space and water heating			4362.1017	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.2845	1.5338	199.8347	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5433	1.4932	-523.4330	
PV Unit electricity exported	-297.8220	0.4600	-137.0015	
Total			-660.4345	(283)
Total Primary energy kWh/year			4031.6027	(286)
Target Primary Energy Rate (TPER)			76.8400	(287)

Full SAP Calculation Printout

Plot Reference	P-40	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-40
Plot Address	Flat 7, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	80 C	**DER**	6.37	**TER**	14.43
Environmental	96 A	**% DER < TER**			55.86
CO_2 Emissions (t/year)	0.28	**DFEE**	35.49	**TFEE**	34.49
Compliance Check	See BREL	**% DFEE < TFEE**			-2.90
% DPER < TPER	14.54	**DPER**	65.67	**TPER**	76.84

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	133.7985	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8400	(17)
Infiltration rate		0.1920	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1632	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.2081	0.2040	0.1999	0.1795	0.1754	0.1550	0.1550	0.1510	0.1632	0.1754	0.1836	0.1918	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.8300	12.4900	28.3400	0.2100	5.9514	110.0000	3117.4002	(29a)
Communal Wall	27.4700	2.0600	25.4100	0.2000	5.0820	110.0000	2795.0999	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			74.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.7733			(33)
Main dwelling								
Party Wall 1			14.6900	0.0000	0.0000	110.0000	1615.9000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			106.0000			9.0000	954.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14393.8001	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							274.3244	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16	Corner (normal)	8.6400	0.0540	0.4666
E18	Party wall between dwellings	2.8800	0.0380	0.1094
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2	Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4	Jamb	18.6000	0.0160	0.2976
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17	Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.6372 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.4105 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	(39)
Average = Sum(39)m / 12 =												54.4872	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	(40)
HLP (average)												1.0384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)
Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)											Total = Sum(45)m =	1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
											Total per year (kWh/year) = Sum(64)m =	1992.4381	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)
Total gains	458.4159	506.6073	563.7674	628.0933	673.9123	665.3305	633.7584	582.7767	526.5195	467.3695	437.0728	438.5997	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	
alpha	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	
util living area	0.9912	0.9830	0.9565	0.8748	0.7115	0.5185	0.3775	0.4284	0.6829	0.9234	0.9830	0.9931	(86)
MIT	20.1191	20.2667	20.5151	20.7876	20.9473	20.9928	20.9991	20.9981	20.9683	20.7388	20.3663	20.0723	(87)
Th 2	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	(88)
util rest of house	0.9883	0.9775	0.9429	0.8404	0.6520	0.4443	0.2966	0.3410	0.6018	0.8929	0.9765	0.9908	(89)
MIT 2	19.0460	19.2317	19.5383	19.8535	20.0126	20.0479	20.0512	20.0508	20.0330	19.8091	19.3595	18.9867	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.5316	19.7000	19.9802	20.2761	20.4355	20.4754	20.4800	20.4794	20.4562	20.2297	19.8150	19.4779	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5316	19.7000	19.9802	20.2761	20.4355	20.4754	20.4800	20.4794	20.4562	20.2297	19.8150	19.4779	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9750	0.9417	0.8492	0.6769	0.4778	0.3332	0.3806	0.6376	0.8994	0.9745	0.9890	(94)
Useful gains	452.0964	493.9177	530.8839	533.3761	456.1510	317.8892	211.1939	221.8059	335.6936	420.3717	425.9162	433.7843	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	829.9254	806.4109	734.4996	619.8528	475.9728	320.1344	211.4126	222.2762	346.3307	524.6978	692.8069	832.4491	(97)
Space heating kWh	281.1047	209.9955	151.4901	62.2632	14.7474	0.0000	0.0000	0.0000	0.0000	77.6186	192.1613	296.6066	(98a)
Space heating requirement - total per year (kWh/year)												1285.9873	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	281.1047	209.9955	151.4901	62.2632	14.7474	0.0000	0.0000	0.0000	0.0000	77.6186	192.1613	296.6066	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1285.9873	
Space heating per m2										(98c) / (4) =		24.5090	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	281.1047	209.9955	151.4901	62.2632	14.7474	0.0000	0.0000	0.0000	0.0000	77.6186	192.1613	296.6066	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	281.1047	209.9955	151.4901	62.2632	14.7474	0.0000	0.0000	0.0000	0.0000	77.6186	192.1613	296.6066	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	1285.9873	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	613.9647	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2061.2021	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1285.9873	16.4900	212.0593	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	16.4900	101.2428	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	16.4900	5.5988	(249)
Energy for lighting	127.2974	16.4900	20.9913	(250)
Additional standing charges			0.0000	(251)
Total energy cost			339.8922	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2554	(257)
SAP value		79.6504	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1285.9873	0.1566	201.3670	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			288.0107	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			311.0933	(272)
CO2 emissions per m2			5.9300	(273)
EI value			95.7231	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700 (1b)	x	2.5500 (2b)	=	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 52.4700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8400	(17)
Infiltration rate		0.1920	(18)
Number of sides sheltered		2	(19)

Shelter factor									(20) = 1 - [0.075 x (19)] =			0.8500	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1632	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1754	0.1673	0.1673	0.1550	0.1591	0.1387	0.1387	0.1346	0.1387	0.1550	0.1510	0.1632	(22b)

Mechanical extract ventilation - centralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.8300	12.4900	28.3400	0.2100	5.9514	110.0000	3117.4002	(29a)
Communal Wall	27.4700	2.0600	25.4100	0.2000	5.0820	110.0000	2795.0999	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			74.3400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.7733			(33)
Main dwelling								
Party Wall 1			14.6900	0.0000	0.0000	110.0000	1615.9000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			106.0000			9.0000	954.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14393.8001	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	274.3244	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.6400	0.0540	0.4666
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.6372	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	32.4105	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	(39)
Average = Sum(39)m / 12 =												54.4872	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	(40)
HLP (average)												1.0384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7629	(42)

Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)	100.8506	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Total per year (kWh/year) = Sum(64)m =												1992.4381	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)

Heat gains from water heating, kWh/month

	57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)

Water heating gains (Table 5)

	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)

Total internal gains

	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(81)
West	7.0700	23.8018	0.3300	0.0000	0.7700	42.7596	(80)

Solar gains	61.7383	107.0049	180.1846	277.6073	342.3516	376.1742	352.3549	302.2168	226.8606	137.6114	76.0861	50.9254	(83)
Total gains	469.3315	512.9598	573.2949	646.3303	687.2905	699.4044	662.6410	614.8861	551.7374	484.4258	449.6123	447.8196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	
alpha	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	
util living area													
	0.9874	0.9772	0.9398	0.8251	0.6244	0.4039	0.2713	0.3011	0.5812	0.8817	0.9738	0.9900	(86)
MIT	20.2209	20.3573	20.6090	20.8617	20.9764	20.9984	20.9999	20.9998	20.9879	20.8250	20.4769	20.1821	(87)
Th 2	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	(88)
util rest of house													
	0.9832	0.9697	0.9210	0.7809	0.5581	0.3309	0.1933	0.2172	0.4947	0.8378	0.9635	0.9865	(89)
MIT 2	19.1750	19.3453	19.6511	19.9313	20.0363	20.0508	20.0514	20.0514	20.0457	19.9023	19.4970	19.1263	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.6482	19.8032	20.0845	20.3522	20.4617	20.4796	20.4805	20.4805	20.4720	20.3197	19.9404	19.6040	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6482	19.8032	20.0845	20.3522	20.4617	20.4796	20.4805	20.4805	20.4720	20.3197	19.9404	19.6040	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9673	0.9218	0.7958	0.5873	0.3640	0.2286	0.2552	0.5337	0.8515	0.9620	0.9844	(94)
Useful gains	460.3619	496.1612	528.4367	514.3196	403.6755	254.5523	151.4845	156.9124	294.4528	412.4693	432.5276	440.8493	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	792.6936	768.4443	691.1441	569.5130	412.0149	254.9769	151.5040	156.9499	298.1530	480.5633	650.5972	790.2812	(97)
Space heating kWh													
	247.2548	182.9743	121.0543	39.7393	6.2045	0.0000	0.0000	0.0000	0.0000	50.6619	157.0101	259.9774	(98a)
Space heating requirement - total per year (kWh/year)												1064.8765	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	247.2548	182.9743	121.0543	39.7393	6.2045	0.0000	0.0000	0.0000	0.0000	50.6619	157.0101	259.9774	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1064.8765	
Space heating per m2											(98c) / (4) =	20.2950	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	247.2548	182.9743	121.0543	39.7393	6.2045	0.0000	0.0000	0.0000	0.0000	50.6619	157.0101	259.9774	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	247.2548	182.9743	121.0543	39.7393	6.2045	0.0000	0.0000	0.0000	0.0000	50.6619	157.0101	259.9774	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
200.7083 177.2366 187.5909 163.2223 157.0696 140.2755 137.5076 143.6565 145.9993 164.3124 176.5711 198.2881 (64)
Efficiency of water heater 324.5200 (216)
(217)m 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 (217)
Fuel for water heating, kWh/month
61.8477 54.6150 57.8057 50.2965 48.4006 43.2255 42.3726 44.2674 44.9893 50.6324 54.4099 61.1020 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 2.8837 2.6046 2.8837 2.7906 2.8837 2.7906 2.8837 2.8837 2.7906 2.8837 2.7906 2.8837 (231)
Lighting 15.7730 12.6537 11.3933 8.3472 6.4476 5.2678 5.8817 7.6453 9.9305 13.0293 14.7166 16.2114 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 1064.8765 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 613.9647 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 33.9527 (230a)
Total electricity for the above, kWh/year 33.9527 (231)
Electricity for lighting (calculated in Appendix L) 127.2974 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1840.0913 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1064.8765	27.6700	294.6513	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	27.6700	169.8840	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	27.6700	9.3947	(249)
Energy for lighting	127.2974	27.6700	35.2232	(250)
Additional standing charges			0.0000	(251)
Total energy cost			509.1533	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1064.8765	0.1574	167.5763	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			254.2200	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			277.3026	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1064.8765	1.5826	1685.2415	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			2619.5900	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			2866.2066	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 80
Current environmental impact rating: A 96

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 80
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£509	£509	£0
Space heating	£304	£304	£0
Water heating	£170	£170	£0
Lighting	£35	£35	£0
Total cost of fuels	£509	£509	£0
Total cost of uses	£509	£509	£0
Delivered energy	35 kWh/m²	35 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	55 kWh/m²	55 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b)	= 133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume					= 133.7985	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8400	(17)
Infiltration rate		0.1920	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1632	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2081	0.2040	0.1999	0.1795	0.1754	0.1550	0.1550	0.1510	0.1632	0.1754	0.1836	0.1918	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation: 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a): 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.8300	12.4900	28.3400	0.2100	5.9514	110.0000	3117.4002	(29a)
Communal Wall	27.4700	2.0600	25.4100	0.2000	5.0820	110.0000	2795.0999	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			74.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.7733			(33)
Main dwelling								
Party Wall 1			14.6900	0.0000	0.0000	110.0000	1615.9000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			106.0000			9.0000	954.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14393.8001 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		274.3244 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.6400	0.0540	0.4666
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.6372 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.4105 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	(39)
Average = Sum(39)m / 12 =												54.4872	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	(40)
HLP (average)												1.0384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7629 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)		100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)											Total = Sum(45)m =	1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
										Total per year (kWh/year) = Sum(64)m =		1992.4381	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)

Total internal gains

	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054 (83)
Total gains	458.4159	506.6073	563.7674	628.0933	673.9123	665.3305	633.7584	582.7767	526.5195	467.3695	437.0728	438.5997 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	
alpha	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	
util living area	0.9912	0.9830	0.9565	0.8748	0.7115	0.5185	0.3775	0.4284	0.6829	0.9234	0.9830	0.9931	(86)
MIT	20.1191	20.2667	20.5151	20.7876	20.9473	20.9928	20.9991	20.9981	20.9683	20.7388	20.3663	20.0723	(87)
Th 2	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	(88)
util rest of house	0.9883	0.9775	0.9429	0.8404	0.6520	0.4443	0.2966	0.3410	0.6018	0.8929	0.9765	0.9908	(89)
MIT 2	19.0460	19.2317	19.5383	19.8535	20.0126	20.0479	20.0512	20.0508	20.0330	19.8091	19.3595	18.9867	(90)
Living area fraction									fLA = Living area / (4) =			0.4524	(91)
MIT	19.5316	19.7000	19.9802	20.2761	20.4355	20.4754	20.4800	20.4794	20.4562	20.2297	19.8150	19.4779	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5316	19.7000	19.9802	20.2761	20.4355	20.4754	20.4800	20.4794	20.4562	20.2297	19.8150	19.4779	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9750	0.9417	0.8492	0.6769	0.4778	0.3332	0.3806	0.6376	0.8994	0.9745	0.9890	(94)
Useful gains	452.0964	493.9177	530.8839	533.3761	456.1510	317.8892	211.1939	221.8059	335.6936	420.3717	425.9162	433.7843	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	829.9254	806.4109	734.4996	619.8528	475.9728	320.1344	211.4126	222.2762	346.3307	524.6978	692.8069	832.4491	(97)
Space heating kWh	281.1047	209.9955	151.4901	62.2632	14.7474	0.0000	0.0000	0.0000	0.0000	77.6186	192.1613	296.6066	(98a)
Space heating requirement - total per year (kWh/year)												1285.9873	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	281.1047	209.9955	151.4901	62.2632	14.7474	0.0000	0.0000	0.0000	0.0000	77.6186	192.1613	296.6066	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1285.9873	
Space heating per m2										(98c) / (4) =		24.5090	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	281.1047	209.9955	151.4901	62.2632	14.7474	0.0000	0.0000	0.0000	0.0000	77.6186	192.1613	296.6066	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	281.1047	209.9955	151.4901	62.2632	14.7474	0.0000	0.0000	0.0000	0.0000	77.6186	192.1613	296.6066	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1285.9873	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	613.9647	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2061.2021	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1285.9873	16.4900	212.0593	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	16.4900	101.2428	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	16.4900	5.5988	(249)
Energy for lighting	127.2974	16.4900	20.9913	(250)
Additional standing charges			0.0000	(251)
Total energy cost			339.8922	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2554	(257)
SAP value		79.6504	
SAP rating (Section 12)		80	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1285.9873	0.1566	201.3670	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			288.0107	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			311.0933	(272)
CO2 emissions per m2			5.9300	(273)
EI value			95.7231	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) =	0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.8400	(17)
Infiltration rate	0.1920	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1632	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1754	0.1673	0.1673	0.1550	0.1591	0.1387	0.1387	0.1346	0.1387	0.1550	0.1510	0.1632	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.8300	12.4900	28.3400	0.2100	5.9514	110.0000	3117.4002	(29a)
Communal Wall	27.4700	2.0600	25.4100	0.2000	5.0820	110.0000	2795.0999	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			74.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.7733			(33)
Main dwelling								
Party Wall 1			14.6900	0.0000	0.0000	110.0000	1615.9000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			106.0000			9.0000	954.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	14393.8001	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	274.3244	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.6400	0.0540	0.4666
E18 Party wall between dwellings	2.8800	0.0380	0.1094
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.6372	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	32.4105	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	54.4872	(39)
Average = Sum(39)m / 12 =												54.4872	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	1.0384	(40)
HLP (average)												1.0384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7629	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)
Hot water usage for baths	23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)
Hot water usage for other uses	32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)
Average daily hot water use (litres/day)												100.8506	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)

If cylinder contains dedicated solar storage

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881 (64)

Total per year (kWh/year) = Sum(64)m = 1992.4381 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)

Water heating gains (Table 5)

	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)

Total internal gains

	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(81)
West	7.0700	23.8018	0.3300	0.0000	0.7700	42.7596	(80)

Solar gains	61.7383	107.0049	180.1846	277.6073	342.3516	376.1742	352.3549	302.2168	226.8606	137.6114	76.0861	50.9254	(83)
Total gains	469.3315	512.9598	573.2949	646.3303	687.2905	699.4044	662.6410	614.8861	551.7374	484.4258	449.6123	447.8196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	73.3801	
alpha	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	5.8920	
util living area													
	0.9874	0.9772	0.9398	0.8251	0.6244	0.4039	0.2713	0.3011	0.5812	0.8817	0.9738	0.9900	(86)
MIT	20.2209	20.3573	20.6090	20.8617	20.9764	20.9984	20.9999	20.9998	20.9879	20.8250	20.4769	20.1821	(87)
Th 2	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	20.0514	(88)
util rest of house													
	0.9832	0.9697	0.9210	0.7809	0.5581	0.3309	0.1933	0.2172	0.4947	0.8378	0.9635	0.9865	(89)
MIT 2	19.1750	19.3453	19.6511	19.9313	20.0363	20.0508	20.0514	20.0514	20.0457	19.9023	19.4970	19.1263	(90)
Living area fraction											fLA = Living area / (4) =	0.4524	(91)
MIT	19.6482	19.8032	20.0845	20.3522	20.4617	20.4796	20.4805	20.4805	20.4720	20.3197	19.9404	19.6040	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6482	19.8032	20.0845	20.3522	20.4617	20.4796	20.4805	20.4805	20.4720	20.3197	19.9404	19.6040	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9673	0.9218	0.7958	0.5873	0.3640	0.2286	0.2552	0.5337	0.8515	0.9620	0.9844	(94)
Useful gains	460.3619	496.1612	528.4367	514.3196	403.6755	254.5523	151.4845	156.9124	294.4528	412.4693	432.5276	440.8493	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	792.6936	768.4443	691.1441	569.5130	412.0149	254.9769	151.5040	156.9499	298.1530	480.5633	650.5972	790.2812	(97)
Space heating kWh													
	247.2548	182.9743	121.0543	39.7393	6.2045	0.0000	0.0000	0.0000	0.0000	50.6619	157.0101	259.9774	(98a)

Space heating requirement - total per year (kWh/year) 1064.8765

Solar heating kWh

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	247.2548	182.9743	121.0543	39.7393	6.2045	0.0000	0.0000	0.0000	0.0000	50.6619	157.0101	259.9774	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1064.8765

Space heating per m2 (98c) / (4) = 20.2950 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	247.2548	182.9743	121.0543	39.7393	6.2045	0.0000	0.0000	0.0000	0.0000	50.6619	157.0101	259.9774	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	247.2548	182.9743	121.0543	39.7393	6.2045	0.0000	0.0000	0.0000	0.0000	50.6619	157.0101	259.9774	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1064.8765 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	613.9647 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)	
mechanical ventilation fans (SFP = 0.2080)	33.9527 (230a)
Total electricity for the above, kWh/year	33.9527 (231)
Electricity for lighting (calculated in Appendix L)	127.2974 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1840.0913 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1064.8765	27.6700	294.6513	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	27.6700	169.8840	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	27.6700	9.3947	(249)
Energy for lighting	127.2974	27.6700	35.2232	(250)
Additional standing charges			0.0000	(251)
Total energy cost			509.1533	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1064.8765	0.1574	167.5763	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			254.2200	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			277.3026	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1064.8765	1.5826	1685.2415	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			2619.5900	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			2866.2066	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-41	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-41
Plot Address	Flat 14, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.19	**TER**	12.85
Environmental	95 A	**% DER < TER**			51.83
CO_2 Emissions (t/year)	0.39	**DFEE**	35.47	**TFEE**	35.26
Compliance Check	See BREL	**% DFEE < TFEE**			-0.60
% DPER < TPER	6.30	**DPER**	63.74	**TPER**	68.02

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	32.72 m	74.70 m²	2.55 m

8.0 Living Area	25.11	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	71.80	53.86	0.00	None	17.94	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	17.55	15.40	0.90	Stairwell Access Corridor 4	2.15	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	13.55	13.55	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	23.59	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	179.59

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	74.70

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	74.70

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.15	
Patio Door	Patio Door	Brickwork	North West	5.42	
NW	Window	Brickwork	North West	9.79	
S	Window	Brickwork	South	2.72	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	59.74	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	14.26	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.70	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	2.85	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	14.98	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	28.20	0.02	0.02	RCD	Yes
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	5.27	0.33	0.33	AbbeyCalculated	No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa

Summary for Input Data

elmhurst energy

Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.19	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	8
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	

25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	

26.0 Heat Networks	None	

27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
ENSUITE	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro	None	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

Summary for Input Data

None

Full SAP Calculation Printout

Plot Reference	P-41	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-41
Plot Address	Flat 14, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.19	**TER**	12.85
Environmental	95 A	**% DER < TER**			51.83
CO_2 Emissions (t/year)	0.39	**DFEE**	35.47	**TFEE**	35.26
Compliance Check	See BREL	**% DFEE < TFEE**			-0.60
% DPER < TPER	6.30	**DPER**	63.74	**TPER**	68.02

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.1900 (17)
Infiltration rate		0.1595 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1729	0.1695	0.1661	0.1491	0.1457	0.1288	0.1288	0.1254	0.1356	0.1457	0.1525	0.1593	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	71.8000	17.9300	53.8700	0.2100	11.3127	110.0000	5925.7003	(29a)
Communal Wall	17.5500	2.1500	15.4000	0.2000	3.0800	110.0000	1693.9999	(29a)
Lift Shaft Wall	13.5500		13.5500	0.1600	2.1680	110.0000	1490.5000	(29a)
Total net area of external elements Aum(A, m2)			102.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.6712			(33)
Main dwelling								
Party Wall 1			23.5900	0.0000	0.0000	110.0000	2594.9000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			179.5900			9.0000	1616.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20791.4103 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		278.3321 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	59.7400	0.0380	2.2701	
E16 Corner (normal)	14.2600	0.0540	0.7700	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529	
E18 Party wall between dwellings	2.8500	0.0380	0.1083	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.9800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E4 Jamb	28.2000	0.0160	0.4512	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.2109	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.8821	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	(39)
Average = Sum(39)m / 12 =												76.3121	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	(40)
HLP (average)												1.0216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3546	(42)
Hot water usage for mixer showers	63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)
Hot water usage for baths	27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)
Hot water usage for other uses	38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)
Average daily hot water use (litres/day)												119.4615	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
										Total per year (kWh/year) = Sum(64)m =		2301.5609	(64)
12Total per year (kWh/year)												2302	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9168	116.1579	104.9168	108.4140	104.9168	108.4140	104.9168	104.9168	108.4140	104.9168	108.4140	104.9168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains	463.2294	474.2558	453.0037	434.9013	410.6494	393.9932	377.3778	378.4747	391.2280	406.4287	434.1485	452.7703	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	75.9198	141.6833	227.3340	338.8287	432.4330	452.7829	426.7461	353.1911	265.2874	165.5550	93.1706	63.5329	(83)
Total gains	539.1491	615.9391	680.3377	773.7300	843.0823	846.7761	804.1239	731.6658	656.5154	571.9837	527.3191	516.3032	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	
alpha	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	
util living area	0.9968	0.9923	0.9790	0.9219	0.7749	0.5678	0.4163	0.4768	0.7490	0.9572	0.9926	0.9976	(86)
MIT	20.0081	20.1690	20.4071	20.7172	20.9241	20.9898	20.9987	20.9971	20.9531	20.6687	20.2768	19.9677	(87)
Th 2	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	(88)
util rest of house	0.9957	0.9895	0.9714	0.8959	0.7174	0.4891	0.3286	0.3816	0.6683	0.9371	0.9895	0.9967	(89)
MIT 2	18.9147	19.1193	19.4189	19.7910	20.0074	20.0603	20.0650	20.0645	20.0369	19.7436	19.2577	18.8631	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	19.2822	19.4721	19.7511	20.1024	20.3155	20.3727	20.3789	20.3780	20.3449	20.0545	19.6003	19.2344	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2822	19.4721	19.7511	20.1024	20.3155	20.3727	20.3789	20.3780	20.3449	20.0545	19.6003	19.2344	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9873	0.9682	0.8971	0.7336	0.5154	0.3581	0.4137	0.6938	0.9368	0.9874	0.9956	(94)
Useful gains	536.1062	608.0926	658.7366	694.1068	618.5234	436.4216	287.9967	302.6957	455.5229	535.8251	520.6667	514.0206	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1143.3247	1112.0299	1011.2192	854.8765	657.4697	440.5304	288.3725	303.5681	476.5589	721.4963	953.9227	1147.3066	(97)
Space heating kWh	451.7706	338.6459	262.2471	115.7542	28.9760	0.0000	0.0000	0.0000	0.0000	138.1393	311.9443	471.1648	(98a)
Space heating requirement - total per year (kWh/year)												2118.6422	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	451.7706	338.6459	262.2471	115.7542	28.9760	0.0000	0.0000	0.0000	0.0000	138.1393	311.9443	471.1648	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2118.6422	
Space heating per m2										(98c) / (4) =		28.3620	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	451.7706	338.6459	262.2471	115.7542	28.9760	0.0000	0.0000	0.0000	0.0000	138.1393	311.9443	471.1648	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	451.7706	338.6459	262.2471	115.7542	28.9760	0.0000	0.0000	0.0000	0.0000	138.1393	311.9443	471.1648	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2118.6422	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												709.2200	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3048.5392	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2118.6422	0.1562	331.0138	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			431.1436	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			462.7226	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.1900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2118.6422	1.5784	3344.1131	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			4423.5869	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			4761.0519	(286)
Dwelling Primary energy Rate (DPER)			63.7400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1575	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4075	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3464	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3723	0.3291	0.3291	0.3204	0.3464	0.3723	0.3897	0.4070	(22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			16.5300	1.1450	18.9275			(27)
Brickwork	71.8000	16.5300	55.2700	0.1800	9.9486			(29a)
Communal Wall	17.5500	2.1500	15.4000	0.1800	2.7720			(29a)
Lift Shaft Wall	13.5500		13.5500	0.1800	2.4390			(29a)
Total net area of external elements Aum(A, m2)			102.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.2371			(33)
Main dwelling								
Party Wall 1			23.5900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 278.3321 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	59.7400	0.0700	4.1818	
E16 Corner (normal)	14.2600	0.0900	1.2834	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130	
E18 Party wall between dwellings	2.8500	0.0600	0.1710	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.9800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E4 Jamb	28.2000	0.0500	1.4100	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.0200	0.1054	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.0636 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 43.3007 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.5598	37.3217	37.0884	35.9926	35.7875	34.8331	34.8331	34.6563	35.2007	35.7875	36.2023	36.6359	(38)
Heat transfer coeff	80.8605	80.6224	80.3891	79.2933	79.0882	78.1338	78.1338	77.9570	78.5014	79.0882	79.5030	79.9366	(39)

Average = Sum(39)m / 12 = 79.2923

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0825	1.0793	1.0762	1.0615	1.0587	1.0460	1.0460	1.0436	1.0509	1.0587	1.0643	1.0701	(40)
HLP (average)												1.0615	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	252.4175	223.1938	236.8779	207.5392	200.7241	180.3575	177.5526	184.8368	187.1391	209.3051	223.3528	249.5509	(62)
WWHRS	-29.1205	-25.7544	-26.9686	-22.3310	-20.8117	-17.8087	-16.6928	-17.7512	-18.4256	-21.7218	-24.6081	-28.5813	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
										Total per year (kWh/year) = Sum(64)m =		2262.2716	(64)
12Total per year (kWh/year)												2262	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	105.7120	93.8870	100.5450	90.0872	88.5239	81.0493	80.8194	83.2414	83.3042	91.3771	95.3452	104.7588	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9351	116.1781	104.9351	108.4329	104.9351	108.4329	104.9351	104.9351	108.4329	104.9351	108.4329	104.9351	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	142.0860	139.7128	135.1411	125.1212	118.9837	112.5685	108.6282	111.8835	115.7003	122.8186	132.4240	140.8048	(72)

Total internal gains	516.3497	527.3781	506.1240	488.0222	463.7697	444.1142	427.4981	428.5950	441.3489	459.5491	487.2695	505.8906	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.5100	46.7521	0.6300	0.7000	0.7700	35.8630	(78)
Northwest	14.0200	11.2829	0.6300	0.7000	0.7700	48.3440	(81)

Solar gains	84.2069	157.1398	252.1125	375.7296	479.5060	502.0628	473.1955	391.6476	294.1926	183.6098	103.3391	70.4690	(83)
Total gains	600.5566	684.5179	758.2366	863.7518	943.2757	946.1769	900.6936	820.2426	735.5414	643.1589	590.6085	576.3596	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.4242	71.6351	71.8430	72.8359	73.0247	73.9167	73.9167	74.0843	73.5706	73.0247	72.6437	72.2496	
alpha	5.7616	5.7757	5.7895	5.8557	5.8683	5.9278	5.9278	5.9390	5.9047	5.8683	5.8429	5.8166	
util living area													
	0.9948	0.9881	0.9694	0.8950	0.7310	0.5227	0.3809	0.4354	0.7002	0.9369	0.9879	0.9958	(86)
MIT	19.9970	20.1715	20.4257	20.7508	20.9386	20.9927	20.9991	20.9980	20.9643	20.7058	20.3030	19.9735	(87)
Th 2	20.0152	20.0178	20.0204	20.0324	20.0347	20.0452	20.0452	20.0472	20.0411	20.0347	20.0301	20.0253	(88)
util rest of house													
	0.9929	0.9840	0.9588	0.8633	0.6707	0.4475	0.2987	0.3462	0.6176	0.9097	0.9829	0.9943	(89)
MIT 2	18.8624	19.0853	19.4046	19.7972	19.9892	20.0417	20.0450	20.0466	20.0203	19.7582	19.2629	18.8401	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	19.2438	19.4504	19.7478	20.1178	20.3083	20.3613	20.3657	20.3664	20.3376	20.0768	19.6125	19.2211	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2438	19.4504	19.7478	20.1178	20.3083	20.3613	20.3657	20.3664	20.3376	20.0768	19.6125	19.2211	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9810	0.9552	0.8664	0.6886	0.4727	0.3264	0.3763	0.6443	0.9111	0.9801	0.9927	(94)
Useful gains	595.1302	671.4795	724.3025	748.3335	649.5295	447.2514	293.9647	308.6202	473.9029	585.9976	578.8711	572.1374	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1208.3605	1173.0888	1064.9814	889.4948	680.8161	450.1559	294.2258	309.2077	489.6637	749.4998	994.7823	1200.7376	(97)
Space heating kWh	456.2433	337.0815	253.4651	101.6361	23.2773	0.0000	0.0000	0.0000	0.0000	121.6457	299.4561	467.6785	(98a)
Space heating requirement - total per year (kWh/year)												2060.4835	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	456.2433	337.0815	253.4651	101.6361	23.2773	0.0000	0.0000	0.0000	0.0000	121.6457	299.4561	467.6785	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2060.4835	
Space heating per m2										(98c) / (4) =		27.5834	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)	
Fraction of space heat from main system(s)	1.0000	(202)	
Efficiency of main space heating system 1 (in %)	92.3000	(206)	
Efficiency of main space heating system 2 (in %)	0.0000	(207)	
Efficiency of secondary/supplementary heating system, %	0.0000	(208)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	456.2433	337.0815	253.4651	101.6361	23.2773	0.0000	0.0000	0.0000	0.0000	121.6457	299.4561	467.6785	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	494.3048	365.2020	274.6101	110.1150	25.2191	0.0000	0.0000	0.0000	0.0000	131.7938	324.4378	506.6939	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6267	85.2486	84.4837	82.7725	80.7374	79.8000	79.8000	79.8000	79.8000	83.1137	84.9768	85.6987	(217)
Fuel for water heating, kWh/month	260.7798	231.6041	248.4614	223.7558	222.8364	203.6952	201.5786	209.3805	211.4205	225.6947	233.8812	257.8449	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.8034	17.4915	15.7492	11.5385	8.9127	7.2817	8.1305	10.5683	13.7271	18.0107	20.3431	22.4094	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.9677	-29.5587	-44.5886	-52.6946	-59.0696	-55.9572	-55.2711	-51.0588	-44.0275	-34.9131	-22.4456	-17.1028	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.3761	-15.8411	-32.0982	-49.1221	-65.8539	-66.5010	-65.7221	-55.2352	-39.9462	-22.9546	-9.9435	-5.8092	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2232.3765	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2730.9331	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.9662	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-923.0586	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4302.2171	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2232.3765	0.2100	468.7991	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2730.9331	0.2100	573.4959	(264)
Space and water heating			1042.2950	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.9662	0.1443	25.3974	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6552	0.1336	-65.0038	
PV Unit electricity exported	-436.4034	0.1253	-54.7027	
Total			-119.7065	(269)
Total CO2, kg/year			959.9151	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2232.3765	1.1300	2522.5854	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2730.9331	1.1300	3085.9544	(278)
Space and water heating			5608.5398	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.9662	1.5338	269.9029	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6552	1.4936	-726.8702	
PV Unit electricity exported	-436.4034	0.4601	-200.7849	
Total			-927.6551	(283)
Total Primary energy kWh/year			5080.8883	(286)
Target Primary Energy Rate (TPER)			68.0200	(287)

Full SAP Calculation Printout

Plot Reference	P-41	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-41
Plot Address	Flat 14, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.19	**TER**	12.85
Environmental	95 A	**% DER < TER**			51.83
CO_2 Emissions (t/year)	0.39	**DFEE**	35.47	**TFEE**	35.26
Compliance Check	See BREL	**% DFEE < TFEE**			-0.60
% DPER < TPER	6.30	**DPER**	63.74	**TPER**	68.02

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1575	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1900	(17)
Infiltration rate		0.3170	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2694	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3435	0.3368	0.3301	0.2964	0.2897	0.2560	0.2560	0.2492	0.2694	0.2897	0.3031	0.3166	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5590	0.5567	0.5545	0.5439	0.5419	0.5328	0.5328	0.5311	0.5363	0.5419	0.5459	0.5501	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	71.8000	17.9300	53.8700	0.2100	11.3127	110.0000	5925.7003	(29a)
Communal Wall	17.5500	2.1500	15.4000	0.2000	3.0800	110.0000	1693.9999	(29a)
Lift Shaft Wall	13.5500		13.5500	0.1600	2.1680	110.0000	1490.5000	(29a)
Total net area of external elements Aum(A, m2)			102.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.6712			(33)
Main dwelling								
Party Wall 1			23.5900	0.0000	0.0000	110.0000	2594.9000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			179.5900			9.0000	1616.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20791.4103 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		278.3321 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	59.7400	0.0380	2.2701	
E16 Corner (normal)	14.2600	0.0540	0.7700	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529	
E18 Party wall between dwellings	2.8500	0.0380	0.1083	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.9800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E4 Jamb	28.2000	0.0160	0.4512	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.2109 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.8821 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.1394	34.9954	34.8542	34.1910	34.0669	33.4894	33.4894	33.3824	33.7118	34.0669	34.3179	34.5804	(38)
Heat transfer coeff	80.0215	79.8775	79.7363	79.0731	78.9490	78.3715	78.3715	78.2645	78.5939	78.9490	79.2000	79.4625	(39)
Average = Sum(39)m / 12 =												79.0725	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0712	1.0693	1.0674	1.0585	1.0569	1.0491	1.0491	1.0477	1.0521	1.0569	1.0602	1.0638	(40)
HLP (average)												1.0585	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 60.7331 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	66.2596	64.4421	62.4578	59.9878	57.7845	55.4946	55.0188	56.9991	59.0301	61.3817	63.8734	66.1666	(44)
Energy conte	104.9390	91.7647	95.9952	82.1204	77.7890	68.2371	66.5404	70.5768	72.7901	83.2943	90.9994	103.6009	(45)
Energy content (annual)										Total = Sum(45)m =		1008.6473	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(64)
										Total per year (kWh/year) = Sum(64)m =		857.3502	(64)
12Total per year (kWh/year)												857	(64)
Electric shower(s)	51.0123	45.4524	49.6322	47.3634	48.2522	46.0279	47.5622	48.2522	47.3634	49.6322	48.6990	51.0123	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		580.2617	(64a)
Heat gains from water heating, kWh/month	35.0526	30.8631	32.8070	29.2914	28.5932	26.0074	26.0304	27.0606	27.3087	30.1081	31.5121	34.7683	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9168	116.1579	104.9168	108.4140	104.9168	108.4140	104.9168	104.9168	108.4140	104.9168	108.4140	104.9168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	47.1137	45.9272	44.0955	40.6825	38.4317	36.1213	34.9871	36.3718	37.9288	40.4679	43.7668	46.7315	(72)
Total internal gains	418.3592	430.5722	412.0601	400.5647	380.1995	367.6482	353.8388	353.0650	363.5585	374.1800	395.5934	408.7991	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	75.9198	141.6833	227.3340	338.8287	432.4330	452.7829	426.7461	353.1911	265.2874	165.5550	93.1706	63.5329	(83)
Total gains	494.2790	572.2556	639.3941	739.3934	812.6324	820.4311	780.5849	706.2561	628.8460	539.7350	488.7640	472.3319	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1730	72.3031	72.4312	73.0386	73.1534	73.6925	73.6925	73.7932	73.4839	73.1534	72.9216	72.6808	
alpha	5.8115	5.8202	5.8287	5.8692	5.8769	5.9128	5.9128	5.9195	5.8989	5.8769	5.8614	5.8454	
util living area	0.9981	0.9950	0.9856	0.9397	0.8079	0.5980	0.4398	0.5051	0.7849	0.9692	0.9952	0.9985	(86)
MIT	19.8749	20.0433	20.2976	20.6496	20.8961	20.9853	20.9979	20.9956	20.9348	20.6013	20.1784	19.8463	(87)
Th 2	20.0244	20.0260	20.0275	20.0348	20.0362	20.0426	20.0426	20.0438	20.0401	20.0362	20.0334	20.0305	(88)
util rest of house	0.9973	0.9932	0.9801	0.9177	0.7516	0.5146	0.3452	0.4027	0.7046	0.9535	0.9931	0.9980	(89)
MIT 2	19.0030	19.1717	19.4240	19.7648	19.9729	20.0368	20.0421	20.0427	20.0083	19.7280	19.3128	18.9795	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	19.2961	19.4647	19.7176	20.0622	20.2832	20.3556	20.3634	20.3630	20.3197	20.0216	19.6038	19.2708	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2961	19.4647	19.7176	20.0622	20.2832	20.3556	20.3634	20.3630	20.3197	20.0216	19.6038	19.2708	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9918	0.9779	0.9184	0.7671	0.5425	0.3771	0.4373	0.7298	0.9532	0.9919	0.9974	(94)
Useful gains	492.5971	567.5394	625.2689	679.0816	623.3754	445.0702	294.3628	308.8244	458.9381	514.4631	484.7871	471.0865	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1200.0069	1163.3889	1053.9230	882.6296	677.6350	451.0756	294.9448	310.1623	488.8313	743.8248	990.3010	1197.5661	(97)
Space heating kWh	526.3129	400.4109	318.9186	146.5546	40.3691	0.0000	0.0000	0.0000	0.0000	170.6451	363.9700	540.5009	(98a)
Space heating requirement - total per year (kWh/year)												2507.6821	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.3129	400.4109	318.9186	146.5546	40.3691	0.0000	0.0000	0.0000	0.0000	170.6451	363.9700	540.5009	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2507.6821	
Space heating per m2										(98c) / (4) =		33.5700	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	736.6917	579.9488	594.8102	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9315	0.9685	0.9463	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	686.2242	561.6592	562.8976	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	919.0631	874.5372	789.7010	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	167.6440	232.7812	168.7417	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.9110	58.1953	42.1854	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												142.2917	(107)
Energy for space heating												33.5700	(99)
Energy for space cooling												1.9048	(108)
Total												35.4749	(109)
Fabric Energy Efficiency (DFEE)												35.5	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		190.4850	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1575 (8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4075	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3464	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3723	0.3291	0.3291	0.3204	0.3464	0.3723	0.3897	0.4070	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			16.5300	1.1450	18.9275			(27)
Brickwork	71.8000	16.5300	55.2700	0.1800	9.9486			(29a)
Communal Wall	17.5500	2.1500	15.4000	0.1800	2.7720			(29a)
Lift Shaft Wall	13.5500		13.5500	0.1800	2.4390			(29a)
Total net area of external elements Aum(A, m2)			102.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.2371			(33)
Main dwelling								
Party Wall 1			23.5900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	278.3321	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.7400	0.0700	4.1818
E16 Corner (normal)	14.2600	0.0900	1.2834
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.9800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0500	1.4100
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.0200	0.1054

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.0636	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	43.3007	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.5598	37.3217	37.0884	35.9926	35.7875	34.8331	34.8331	34.6563	35.2007	35.7875	36.2023	36.6359	(38)
Heat transfer coeff	80.8605	80.6224	80.3891	79.2933	79.0882	78.1338	78.1338	77.9570	78.5014	79.0882	79.5030	79.9366	(39)
Average = Sum(39)m / 12 =												79.2923	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0825	1.0793	1.0762	1.0615	1.0587	1.0460	1.0460	1.0436	1.0509	1.0587	1.0643	1.0701	(40)
HLP (average)												1.0615	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3546	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day)	60.7331	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	66.2596	64.4421	62.4578	59.9878	57.7845	55.4946	55.0188	56.9991	59.0301	61.3817	63.8734	66.1666	(44)
Energy conte	104.9390	91.7647	95.9952	82.1204	77.7890	68.2371	66.5404	70.5768	72.7901	83.2943	90.9994	103.6009	(45)
Energy content (annual)										Total = Sum(45)m =		1008.6473	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(64)

Total per year (kWh/year) = Sum(64)m =	857.3502	(64)
12Total per year (kWh/year)	857	(64)

Electric shower(s)

51.0123	45.4524	49.6322	47.3634	48.2522	46.0279	47.5622	48.2522	47.3634	49.6322	48.6990	51.0123	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	580.2617	(64a)

Heat gains from water heating, kWh/month

35.0526	30.8631	32.8070	29.2914	28.5932	26.0074	26.0304	27.0606	27.3087	30.1081	31.5121	34.7683	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	104.9351	116.1781	104.9351	108.4329	104.9351	108.4329	104.9351	104.9351	108.4329	104.9351	108.4329	104.9351	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)													
	47.1137	45.9272	44.0955	40.6825	38.4317	36.1213	34.9871	36.3718	37.9288	40.4679	43.7668	46.7315	(72)
Total internal gains													
	418.3774	430.5925	412.0784	400.5836	380.2178	367.6671	353.8570	353.0833	363.5774	374.1983	395.6123	408.8173	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.5100	46.7521	0.6300	0.7000	0.7700	35.8630	(78)
Northwest	14.0200	11.2829	0.6300	0.7000	0.7700	48.3440	(81)

Solar gains	84.2069	157.1398	252.1125	375.7296	479.5060	502.0628	473.1955	391.6476	294.1926	183.6098	103.3391	70.4690	(83)
Total gains	502.5844	587.7323	664.1909	776.3132	859.7237	869.7298	827.0526	744.7309	657.7700	557.8081	498.9514	479.2864	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.4242	71.6351	71.8430	72.8359	73.0247	73.9167	73.9167	74.0843	73.5706	73.0247	72.6437	72.2496	
alpha	5.7616	5.7757	5.7895	5.8557	5.8683	5.9278	5.9278	5.9390	5.9047	5.8683	5.8429	5.8166	
util living area													
	0.9979	0.9943	0.9831	0.9279	0.7803	0.5656	0.4143	0.4782	0.7609	0.9646	0.9947	0.9984	(86)
MIT	19.8693	20.0489	20.3163	20.6804	20.9135	20.9891	20.9985	20.9967	20.9449	20.6195	20.1866	19.8461	(87)
Th 2	20.0152	20.0178	20.0204	20.0324	20.0347	20.0452	20.0452	20.0472	20.0411	20.0347	20.0301	20.0253	(88)
util rest of house													
	0.9971	0.9923	0.9767	0.9030	0.7219	0.4855	0.3252	0.3810	0.6792	0.9470	0.9924	0.9978	(89)
MIT 2	18.9900	19.1706	19.4361	19.7894	19.9831	20.0410	20.0449	20.0464	20.0148	19.7432	19.3182	18.9751	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	19.2856	19.4658	19.7319	20.0889	20.2958	20.3597	20.3654	20.3658	20.3275	20.0378	19.6101	19.2679	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2856	19.4658	19.7319	20.0889	20.2958	20.3597	20.3654	20.3658	20.3275	20.0378	19.6101	19.2679	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9907	0.9744	0.9046	0.7386	0.5124	0.3552	0.4138	0.7052	0.9471	0.9911	0.9972	(94)
Useful gains	500.7326	582.2935	647.1693	702.2728	635.0255	445.6072	293.7943	308.1860	463.8828	528.3059	494.4947	477.9273	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1211.7394	1174.3336	1063.7046	887.2059	679.8290	450.0241	294.2085	309.1648	488.8654	746.4190	994.5877	1204.4741	(97)
Space heating kWh													
	528.9890	397.8509	309.9023	133.1518	33.3338	0.0000	0.0000	0.0000	0.0000	162.2761	360.0670	540.5508	(98a)
Space heating requirement - total per year (kWh/year)												2466.1218	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	528.9890	397.8509	309.9023	133.1518	33.3338	0.0000	0.0000	0.0000	0.0000	162.2761	360.0670	540.5508	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2466.1218	
Space heating per m2										(98c) / (4) =		33.0137	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	734.4574	578.1899	592.4733	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9468	0.9764	0.9582	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	695.4105	564.5359	567.7202	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	976.6646	928.8304	834.6524	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	202.5029	271.0351	198.5975	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	50.6257	67.7588	49.6494	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												168.0339	(107)
Energy for space heating												33.0137	(99)
Energy for space cooling												2.2494	(108)
Total												35.2631	(109)
Fabric Energy Efficiency (TFEE)												35.3	(109)

Full SAP Calculation Printout

Plot Reference	P-41	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-41
Plot Address	Flat 14, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.19	**TER**	12.85
Environmental	95 A	**% DER < TER**			51.83
CO_2 Emissions (t/year)	0.39	**DFEE**	35.47	**TFEE**	35.26
Compliance Check	See BREL	**% DFEE < TFEE**			-0.60
% DPER < TPER	6.30	**DPER**	63.74	**TPER**	68.02

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.1900 (17)
Infiltration rate		0.1595 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1729	0.1695	0.1661	0.1491	0.1457	0.1288	0.1288	0.1254	0.1356	0.1457	0.1525	0.1593	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	71.8000	17.9300	53.8700	0.2100	11.3127	110.0000	5925.7003	(29a)
Communal Wall	17.5500	2.1500	15.4000	0.2000	3.0800	110.0000	1693.9999	(29a)
Lift Shaft Wall	13.5500		13.5500	0.1600	2.1680	110.0000	1490.5000	(29a)
Total net area of external elements Aum(A, m2)			102.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.6712			(33)
Main dwelling								
Party Wall 1			23.5900	0.0000	0.0000	110.0000	2594.9000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			179.5900			9.0000	1616.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20791.4103 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		278.3321 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	59.7400	0.0380	2.2701	
E16 Corner (normal)	14.2600	0.0540	0.7700	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529	
E18 Party wall between dwellings	2.8500	0.0380	0.1083	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.9800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E4 Jamb	28.2000	0.0160	0.4512	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.2109	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	44.8821	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	(39)
Average = Sum(39)m / 12 =												76.3121	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	(40)
HLP (average)												1.0216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3546	(42)
Hot water usage for mixer showers	63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)
Hot water usage for baths	27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)
Hot water usage for other uses	38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)
Average daily hot water use (litres/day)												119.4615	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
										Total per year (kWh/year) = Sum(64)m =		2301.5609	(64)
12Total per year (kWh/year)												2302	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9168	116.1579	104.9168	108.4140	104.9168	108.4140	104.9168	104.9168	108.4140	104.9168	108.4140	104.9168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains	463.2294	474.2558	453.0037	434.9013	410.6494	393.9932	377.3778	378.4747	391.2280	406.4287	434.1485	452.7703	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	75.9198	141.6833	227.3340	338.8287	432.4330	452.7829	426.7461	353.1911	265.2874	165.5550	93.1706	63.5329	(83)
Total gains	539.1491	615.9391	680.3377	773.7300	843.0823	846.7761	804.1239	731.6658	656.5154	571.9837	527.3191	516.3032	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	
alpha	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	
util living area	0.9968	0.9923	0.9790	0.9219	0.7749	0.5678	0.4163	0.4768	0.7490	0.9572	0.9926	0.9976	(86)
MIT	20.0081	20.1690	20.4071	20.7172	20.9241	20.9898	20.9987	20.9971	20.9531	20.6687	20.2768	19.9677	(87)
Th 2	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	(88)
util rest of house	0.9957	0.9895	0.9714	0.8959	0.7174	0.4891	0.3286	0.3816	0.6683	0.9371	0.9895	0.9967	(89)
MIT 2	18.9147	19.1193	19.4189	19.7910	20.0074	20.0603	20.0650	20.0645	20.0369	19.7436	19.2577	18.8631	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	19.2822	19.4721	19.7511	20.1024	20.3155	20.3727	20.3789	20.3780	20.3449	20.0545	19.6003	19.2344	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2822	19.4721	19.7511	20.1024	20.3155	20.3727	20.3789	20.3780	20.3449	20.0545	19.6003	19.2344	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9873	0.9682	0.8971	0.7336	0.5154	0.3581	0.4137	0.6938	0.9368	0.9874	0.9956	(94)
Useful gains	536.1062	608.0926	658.7366	694.1068	618.5234	436.4216	287.9967	302.6957	455.5229	535.8251	520.6667	514.0206	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1143.3247	1112.0299	1011.2192	854.8765	657.4697	440.5304	288.3725	303.5681	476.5589	721.4963	953.9227	1147.3066	(97)
Space heating kWh	451.7706	338.6459	262.2471	115.7542	28.9760	0.0000	0.0000	0.0000	0.0000	138.1393	311.9443	471.1648	(98a)
Space heating requirement - total per year (kWh/year)												2118.6422	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	451.7706	338.6459	262.2471	115.7542	28.9760	0.0000	0.0000	0.0000	0.0000	138.1393	311.9443	471.1648	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2118.6422	
Space heating per m2										(98c) / (4) =		28.3620	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	451.7706	338.6459	262.2471	115.7542	28.9760	0.0000	0.0000	0.0000	0.0000	138.1393	311.9443	471.1648	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	451.7706	338.6459	262.2471	115.7542	28.9760	0.0000	0.0000	0.0000	0.0000	138.1393	311.9443	471.1648	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2118.6422	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												709.2200	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3048.5392	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2118.6422	0.1562	331.0138	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			431.1436	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			462.7226	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.1900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2118.6422	1.5784	3344.1131	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			4423.5869	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			4761.0519	(286)
Dwelling Primary energy Rate (DPER)			63.7400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1575	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4075	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3464	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3723	0.3291	0.3291	0.3204	0.3464	0.3723	0.3897	0.4070	(22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			16.5300	1.1450	18.9275			(27)
Brickwork	71.8000	16.5300	55.2700	0.1800	9.9486			(29a)
Communal Wall	17.5500	2.1500	15.4000	0.1800	2.7720			(29a)
Lift Shaft Wall	13.5500		13.5500	0.1800	2.4390			(29a)
Total net area of external elements Aum(A, m2)			102.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.2371			(33)
Main dwelling								
Party Wall 1			23.5900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 278.3321 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	59.7400	0.0700	4.1818	
E16 Corner (normal)	14.2600	0.0900	1.2834	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130	
E18 Party wall between dwellings	2.8500	0.0600	0.1710	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.9800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E4 Jamb	28.2000	0.0500	1.4100	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.0200	0.1054	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.0636 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 43.3007 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.5598	37.3217	37.0884	35.9926	35.7875	34.8331	34.8331	34.6563	35.2007	35.7875	36.2023	36.6359	(38)
Heat transfer coeff	80.8605	80.6224	80.3891	79.2933	79.0882	78.1338	78.1338	77.9570	78.5014	79.0882	79.5030	79.9366	(39)

Average = Sum(39)m / 12 = 79.2923

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0825	1.0793	1.0762	1.0615	1.0587	1.0460	1.0460	1.0436	1.0509	1.0587	1.0643	1.0701	(40)
HLP (average)												1.0615	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	252.4175	223.1938	236.8779	207.5392	200.7241	180.3575	177.5526	184.8368	187.1391	209.3051	223.3528	249.5509	(62)
WWHRS	-29.1205	-25.7544	-26.9686	-22.3310	-20.8117	-17.8087	-16.6928	-17.7512	-18.4256	-21.7218	-24.6081	-28.5813	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
										Total per year (kWh/year) = Sum(64)m =		2262.2716	(64)
12Total per year (kWh/year)												2262	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	105.7120	93.8870	100.5450	90.0872	88.5239	81.0493	80.8194	83.2414	83.3042	91.3771	95.3452	104.7588	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9351	116.1781	104.9351	108.4329	104.9351	108.4329	104.9351	104.9351	108.4329	104.9351	108.4329	104.9351	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	142.0860	139.7128	135.1411	125.1212	118.9837	112.5685	108.6282	111.8835	115.7003	122.8186	132.4240	140.8048	(72)

Total internal gains	516.3497	527.3781	506.1240	488.0222	463.7697	444.1142	427.4981	428.5950	441.3489	459.5491	487.2695	505.8906	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.5100	46.7521	0.6300	0.7000	0.7700	35.8630	(78)
Northwest	14.0200	11.2829	0.6300	0.7000	0.7700	48.3440	(81)

Solar gains	84.2069	157.1398	252.1125	375.7296	479.5060	502.0628	473.1955	391.6476	294.1926	183.6098	103.3391	70.4690	(83)
Total gains	600.5566	684.5179	758.2366	863.7518	943.2757	946.1769	900.6936	820.2426	735.5414	643.1589	590.6085	576.3596	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.4242	71.6351	71.8430	72.8359	73.0247	73.9167	73.9167	74.0843	73.5706	73.0247	72.6437	72.2496	
alpha	5.7616	5.7757	5.7895	5.8557	5.8683	5.9278	5.9278	5.9390	5.9047	5.8683	5.8429	5.8166	
util living area													
	0.9948	0.9881	0.9694	0.8950	0.7310	0.5227	0.3809	0.4354	0.7002	0.9369	0.9879	0.9958	(86)
MIT	19.9970	20.1715	20.4257	20.7508	20.9386	20.9927	20.9991	20.9980	20.9643	20.7058	20.3030	19.9735	(87)
Th 2	20.0152	20.0178	20.0204	20.0324	20.0347	20.0452	20.0452	20.0472	20.0411	20.0347	20.0301	20.0253	(88)
util rest of house													
	0.9929	0.9840	0.9588	0.8633	0.6707	0.4475	0.2987	0.3462	0.6176	0.9097	0.9829	0.9943	(89)
MIT 2	18.8624	19.0853	19.4046	19.7972	19.9892	20.0417	20.0450	20.0466	20.0203	19.7582	19.2629	18.8401	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	19.2438	19.4504	19.7478	20.1178	20.3083	20.3613	20.3657	20.3664	20.3376	20.0768	19.6125	19.2211	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2438	19.4504	19.7478	20.1178	20.3083	20.3613	20.3657	20.3664	20.3376	20.0768	19.6125	19.2211	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9810	0.9552	0.8664	0.6886	0.4727	0.3264	0.3763	0.6443	0.9111	0.9801	0.9927	(94)
Useful gains	595.1302	671.4795	724.3025	748.3335	649.5295	447.2514	293.9647	308.6202	473.9029	585.9976	578.8711	572.1374	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1208.3605	1173.0888	1064.9814	889.4948	680.8161	450.1559	294.2258	309.2077	489.6637	749.4998	994.7823	1200.7376	(97)
Space heating kWh	456.2433	337.0815	253.4651	101.6361	23.2773	0.0000	0.0000	0.0000	0.0000	121.6457	299.4561	467.6785	(98a)
Space heating requirement - total per year (kWh/year)												2060.4835	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	456.2433	337.0815	253.4651	101.6361	23.2773	0.0000	0.0000	0.0000	0.0000	121.6457	299.4561	467.6785	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2060.4835	
Space heating per m2										(98c) / (4) =		27.5834	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)	
Fraction of space heat from main system(s)	1.0000	(202)	
Efficiency of main space heating system 1 (in %)	92.3000	(206)	
Efficiency of main space heating system 2 (in %)	0.0000	(207)	
Efficiency of secondary/supplementary heating system, %	0.0000	(208)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	456.2433	337.0815	253.4651	101.6361	23.2773	0.0000	0.0000	0.0000	0.0000	121.6457	299.4561	467.6785	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	494.3048	365.2020	274.6101	110.1150	25.2191	0.0000	0.0000	0.0000	0.0000	131.7938	324.4378	506.6939	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6267	85.2486	84.4837	82.7725	80.7374	79.8000	79.8000	79.8000	79.8000	83.1137	84.9768	85.6987	(217)
Fuel for water heating, kWh/month	260.7798	231.6041	248.4614	223.7558	222.8364	203.6952	201.5786	209.3805	211.4205	225.6947	233.8812	257.8449	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.8034	17.4915	15.7492	11.5385	8.9127	7.2817	8.1305	10.5683	13.7271	18.0107	20.3431	22.4094	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.9677	-29.5587	-44.5886	-52.6946	-59.0696	-55.9572	-55.2711	-51.0588	-44.0275	-34.9131	-22.4456	-17.1028	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.3761	-15.8411	-32.0982	-49.1221	-65.8539	-66.5010	-65.7221	-55.2352	-39.9462	-22.9546	-9.9435	-5.8092	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2232.3765	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2730.9331	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.9662	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-923.0586	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4302.2171	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2232.3765	0.2100	468.7991	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2730.9331	0.2100	573.4959	(264)
Space and water heating			1042.2950	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.9662	0.1443	25.3974	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6552	0.1336	-65.0038	
PV Unit electricity exported	-436.4034	0.1253	-54.7027	
Total			-119.7065	(269)
Total CO2, kg/year			959.9151	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2232.3765	1.1300	2522.5854	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2730.9331	1.1300	3085.9544	(278)
Space and water heating			5608.5398	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.9662	1.5338	269.9029	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6552	1.4936	-726.8702	
PV Unit electricity exported	-436.4034	0.4601	-200.7849	
Total			-927.6551	(283)
Total Primary energy kWh/year			5080.8883	(286)
Target Primary Energy Rate (TPER)			68.0200	(287)

Full SAP Calculation Printout

Plot Reference	P-41	Issued on Date	24/04/2026
Assessment Reference	As Built	Plot Type Ref	P-41
Plot Address	Flat 14, 3 Carters Close, READING, RG1 8GR	SAP Version	10.2

SAP Rating	77 C	DER	6.19	TER	12.85
Environmental	95 A	% DER < TER			51.83
CO_2 Emissions (t/year)	0.39	DFEE	35.47	TFEE	35.26
Compliance Check	See BREL	% DFEE < TFEE			-0.60
% DPER < TPER	6.30	DPER	63.74	TPER	68.02

Assessor Details	Mr. Matthew Fitzpatrick	Assessor ID	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.1900 (17)
Infiltration rate		0.1595 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1729	0.1695	0.1661	0.1491	0.1457	0.1288	0.1288	0.1254	0.1356	0.1457	0.1525	0.1593	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	71.8000	17.9300	53.8700	0.2100	11.3127	110.0000	5925.7003	(29a)
Communal Wall	17.5500	2.1500	15.4000	0.2000	3.0800	110.0000	1693.9999	(29a)
Lift Shaft Wall	13.5500		13.5500	0.1600	2.1680	110.0000	1490.5000	(29a)
Total net area of external elements Aum(A, m2)			102.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.6712			(33)
Main dwelling								
Party Wall 1			23.5900	0.0000	0.0000	110.0000	2594.9000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			179.5900			9.0000	1616.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20791.4103 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		278.3321 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.7400	0.0380	2.2701
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.9800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.2109 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.8821 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	(39)

Average = Sum(39)m / 12 = 76.3121

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	(40)
HLP (average)												1.0216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)

Energy content (annual) Total = Sum(45)m = 1984.2299

Distribution loss (46)m = 0.15 x (45)m

30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)

Total per year (kWh/year) = Sum(64)m = 2301.5609 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	75.9198	141.6833	227.3340	338.8287	432.4330	452.7829	426.7461	353.1911	265.2874	165.5550	93.1706	63.5329	(83)

Total gains	601.3366	665.2209	734.1350	814.0455	876.3272	868.2038	825.2065	754.4129	682.4909	611.4409	573.8471	574.6483	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	
alpha	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	
util living area	0.9943	0.9886	0.9702	0.9061	0.7542	0.5548	0.4058	0.4629	0.7277	0.9436	0.9887	0.9957	(86)
MIT	20.0895	20.2315	20.4693	20.7499	20.9344	20.9910	20.9988	20.9975	20.9598	20.7083	20.3359	20.0445	(87)
Th 2	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	(88)
util rest of house	0.9924	0.9847	0.9600	0.8769	0.6958	0.4774	0.3202	0.3702	0.6466	0.9189	0.9841	0.9942	(89)
MIT 2	19.0182	19.1980	19.4947	19.8266	20.0160	20.0609	20.0651	20.0646	20.0414	19.7882	19.3319	18.9610	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	19.3783	19.5454	19.8223	20.1370	20.3247	20.3735	20.3789	20.3782	20.3501	20.0975	19.6694	19.3253	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3783	19.5454	19.8223	20.1370	20.3247	20.3735	20.3789	20.3782	20.3501	20.0975	19.6694	19.3253	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9905	0.9820	0.9568	0.8794	0.7128	0.5033	0.3491	0.4014	0.6726	0.9199	0.9815	0.9925	(94)
Useful gains	595.5989	653.2159	702.4375	715.8562	624.6856	436.9670	288.0535	302.8456	459.0615	562.4540	563.2364	570.3597	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1150.6580	1117.6212	1016.6556	857.5192	658.1696	440.5914	288.3795	303.5860	476.9574	724.7749	959.1956	1154.2404	(97)
Space heating kWh	412.9640	312.0804	233.7783	101.9973	24.9121	0.0000	0.0000	0.0000	0.0000	120.7667	285.0906	434.4072	(98a)
Space heating requirement - total per year (kWh/year)												1925.9966	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	412.9640	312.0804	233.7783	101.9973	24.9121	0.0000	0.0000	0.0000	0.0000	120.7667	285.0906	434.4072	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1925.9966	
Space heating per m2											(98c) / (4) =	25.7831	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	412.9640	312.0804	233.7783	101.9973	24.9121	0.0000	0.0000	0.0000	0.0000	120.7667	285.0906	434.4072	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	412.9640	312.0804	233.7783	101.9973	24.9121	0.0000	0.0000	0.0000	0.0000	120.7667	285.0906	434.4072	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1925.9966	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												709.2200	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 48.3375 (230a)
Total electricity for the above, kWh/year 48.3375 (231)
Electricity for lighting (calculated in Appendix L) 172.3395 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2855.8937 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1925.9966	16.4900	317.5968	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	16.4900	116.9504	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	16.4900	7.9708	(249)
Energy for lighting	172.3395	16.4900	28.4188	(250)
Additional standing charges			0.0000	(251)
Total energy cost			470.9369	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.4164 (257)
SAP value 77.0409
SAP rating (Section 12) 77 (258)
SAP band C

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1925.9966	0.1564	301.1694	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			401.2992	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			432.8782	(272)
CO2 emissions per m2			5.7900	(273)
EI value			95.1541	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b) x	2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		190.4850	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1900	(17)
Infiltration rate		0.1595	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1457	0.1390	0.1390	0.1288	0.1322	0.1152	0.1152	0.1118	0.1152	0.1288	0.1254	0.1356	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	71.8000	17.9300	53.8700	0.2100	11.3127	110.0000	5925.7003	(29a)
Communal Wall	17.5500	2.1500	15.4000	0.2000	3.0800	110.0000	1693.9999	(29a)
Lift Shaft Wall	13.5500		13.5500	0.1600	2.1680	110.0000	1490.5000	(29a)
Total net area of external elements Aum(A, m2)			102.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.6712			(33)
Main dwelling								
Party Wall 1			23.5900	0.0000	0.0000	110.0000	2594.9000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			179.5900			9.0000	1616.3100	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20791.4103 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 278.3321 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.7400	0.0380	2.2701
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.9800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.2109 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.8821 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	(39)

Average = Sum(39)m / 12 = 76.3121

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	(40)
HLP (average)												1.0216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)
Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
									Total per year (kWh/year) = Sum(64)m =		2301.5609	(64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850 (71)

Water heating gains (Table 5)

	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028 (72)

Total internal gains

	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(81)
South	2.7200	54.2217	0.3300	0.0000	0.7700	37.4754	(78)
Northwest	9.7900	13.7804	0.3300	0.0000	0.7700	34.2807	(81)

Solar gains	90.7348	148.7325	238.5650	362.6895	451.3625	499.7020	466.4379	395.8083	297.4681	187.0402	109.8532	76.2642	(83)
Total gains	616.1517	672.2701	745.3660	837.9064	895.2567	915.1230	864.8982	797.0301	714.6716	632.9261	590.5297	587.3796	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	
alpha	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	
util living area													
	0.9917	0.9846	0.9578	0.8627	0.6659	0.4321	0.2910	0.3253	0.6244	0.9093	0.9819	0.9935	(86)
MIT	20.1893	20.3194	20.5640	20.8328	20.9704	20.9981	20.9999	20.9997	20.9843	20.7988	20.4452	20.1524	(87)
Th 2	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	(88)
util rest of house													
	0.9888	0.9792	0.9434	0.8230	0.5983	0.3552	0.2087	0.2360	0.5348	0.8715	0.9744	0.9912	(89)
MIT 2	19.1452	19.3090	19.6105	19.9166	20.0461	20.0647	20.0654	20.0653	20.0578	19.8891	19.4690	19.0985	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	19.4962	19.6487	19.9310	20.2245	20.3568	20.3784	20.3795	20.3794	20.3693	20.1949	19.7972	19.4528	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4962	19.6487	19.9310	20.2245	20.3568	20.3784	20.3795	20.3794	20.3693	20.1949	19.7972	19.4528	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9762	0.9409	0.8303	0.6200	0.3811	0.2364	0.2661	0.5647	0.8775	0.9717	0.9891	(94)
Useful gains	607.8068	656.2472	701.3005	695.7521	555.0762	348.7490	204.4523	212.0526	403.5629	555.3906	573.7947	581.0021	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1098.6049	1064.4513	956.2690	787.8881	569.0452	349.3901	204.4778	212.1047	409.7395	663.5285	900.2658	1095.2893	(97)
Space heating kWh													
	365.1538	274.3131	189.6966	66.3379	10.3930	0.0000	0.0000	0.0000	0.0000	80.4546	235.0592	382.6296	(98a)
Space heating requirement - total per year (kWh/year)												1604.0378	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	365.1538	274.3131	189.6966	66.3379	10.3930	0.0000	0.0000	0.0000	0.0000	80.4546	235.0592	382.6296	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1604.0378	
Space heating per m2											(98c) / (4) =	21.4731	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	365.1538	274.3131	189.6966	66.3379	10.3930	0.0000	0.0000	0.0000	0.0000	80.4546	235.0592	382.6296	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	365.1538	274.3131	189.6966	66.3379	10.3930	0.0000	0.0000	0.0000	0.0000	80.4546	235.0592	382.6296	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement												
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074 (64)
Efficiency of water heater												324.5200 (216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200 (217)
Fuel for water heating, kWh/month												
	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054 (231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1604.0378 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	709.2200 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)	
mechanical ventilation fans (SFP = 0.2080)	48.3375 (230a)
Total electricity for the above, kWh/year	48.3375 (231)
Electricity for lighting (calculated in Appendix L)	172.3395 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2533.9348 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1604.0378	27.6700	443.8372	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	27.6700	196.2412	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	27.6700	13.3750	(249)
Energy for lighting	172.3395	27.6700	47.6863	(250)
Additional standing charges			0.0000	(251)
Total energy cost			701.1398	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1604.0378	0.1572	252.0963	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			352.2261	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			383.8051	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1604.0378	1.5818	2537.3166	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			3616.7903	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			3954.2554	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 77
Current environmental impact rating: A 95

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 77
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£701	£701	£0
Space heating	£457	£457	£0
Water heating	£196	£196	£0
Lighting	£48	£48	£0
Total cost of fuels	£701	£701	£0
Total cost of uses	£701	£701	£0
Delivered energy	34 kWh/m²	34 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	53 kWh/m²	53 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		190.4850	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1900	(17)
Infiltration rate		0.1595	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1356	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1729	0.1695	0.1661	0.1491	0.1457	0.1288	0.1288	0.1254	0.1356	0.1457	0.1525	0.1593	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	71.8000	17.9300	53.8700	0.2100	11.3127	110.0000	5925.7003	(29a)
Communal Wall	17.5500	2.1500	15.4000	0.2000	3.0800	110.0000	1693.9999	(29a)
Lift Shaft Wall	13.5500		13.5500	0.1600	2.1680	110.0000	1490.5000	(29a)
Total net area of external elements Aum(A, m2)			102.9000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.6712			(33)
Main dwelling								
Party Wall 1			23.5900	0.0000	0.0000	110.0000	2594.9000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			179.5900			9.0000	1616.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20791.4103 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		278.3321 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.7400	0.0380	2.2701
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.9800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.2109 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.8821 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	(39)
Average = Sum(39)m / 12 =												76.3121	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	(40)
HLP (average)												1.0216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.3546 (42)

Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day)		119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
										Total per year (kWh/year) = Sum(64)m =		2301.5609	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)

Water heating gains (Table 5)													
	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains													
	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
South	2.7200	46.7521	0.3300	0.0000	0.7700	32.3128	(78)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	75.9198	141.6833	227.3340	338.8287	432.4330	452.7829	426.7461	353.1911	265.2874	165.5550	93.1706	63.5329	(83)
Total gains	601.3366	665.2209	734.1350	814.0455	876.3272	868.2038	825.2065	754.4129	682.4909	611.4409	573.8471	574.6483	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	
alpha	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	
util living area													
	0.9943	0.9886	0.9702	0.9061	0.7542	0.5548	0.4058	0.4629	0.7277	0.9436	0.9887	0.9957	(86)
MIT	20.0895	20.2315	20.4693	20.7499	20.9344	20.9910	20.9988	20.9975	20.9598	20.7083	20.3359	20.0445	(87)
Th 2	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	(88)
util rest of house													
	0.9924	0.9847	0.9600	0.8769	0.6958	0.4774	0.3202	0.3702	0.6466	0.9189	0.9841	0.9942	(89)
MIT 2	19.0182	19.1980	19.4947	19.8266	20.0160	20.0609	20.0651	20.0646	20.0414	19.7882	19.3319	18.9610	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	19.3783	19.5454	19.8223	20.1370	20.3247	20.3735	20.3789	20.3782	20.3501	20.0975	19.6694	19.3253	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3783	19.5454	19.8223	20.1370	20.3247	20.3735	20.3789	20.3782	20.3501	20.0975	19.6694	19.3253	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9905	0.9820	0.9568	0.8794	0.7128	0.5033	0.3491	0.4014	0.6726	0.9199	0.9815	0.9925	(94)
Useful gains	595.5989	653.2159	702.4375	715.8562	624.6856	436.9670	288.0535	302.8456	459.0615	562.4540	563.2364	570.3597	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1150.6580	1117.6212	1016.6556	857.5192	658.1696	440.5914	288.3795	303.5860	476.9574	724.7749	959.1956	1154.2404	(97)
Space heating kWh													
	412.9640	312.0804	233.7783	101.9973	24.9121	0.0000	0.0000	0.0000	0.0000	120.7667	285.0906	434.4072	(98a)
Space heating requirement - total per year (kWh/year)												1925.9966	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	412.9640	312.0804	233.7783	101.9973	24.9121	0.0000	0.0000	0.0000	0.0000	120.7667	285.0906	434.4072	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1925.9966	
Space heating per m2											(98c) / (4) =	25.7831	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	412.9640	312.0804	233.7783	101.9973	24.9121	0.0000	0.0000	0.0000	0.0000	120.7667	285.0906	434.4072	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	412.9640	312.0804	233.7783	101.9973	24.9121	0.0000	0.0000	0.0000	0.0000	120.7667	285.0906	434.4072	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1925.9966	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	709.2200	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2855.8937	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1925.9966	16.4900	317.5968	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	16.4900	116.9504	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	16.4900	7.9708	(249)
Energy for lighting	172.3395	16.4900	28.4188	(250)
Additional standing charges			0.0000	(251)
Total energy cost			470.9369	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.4164	(257)
SAP value		77.0409	
SAP rating (Section 12)		77	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1925.9966	0.1564	301.1694	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			401.2992	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			432.8782	(272)
CO2 emissions per m2			5.7900	(273)
EI value			95.1541	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		190.4850	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1900	(17)
Infiltration rate		0.1595	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1356	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate													
	0.1457	0.1390	0.1390	0.1288	0.1322	0.1152	0.1152	0.1118	0.1152	0.1288	0.1254	0.1356	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	71.8000	17.9300	53.8700	0.2100	11.3127	110.0000	5925.7003	(29a)
Communal Wall	17.5500	2.1500	15.4000	0.2000	3.0800	110.0000	1693.9999	(29a)
Lift Shaft Wall	13.5500		13.5500	0.1600	2.1680	110.0000	1490.5000	(29a)
Total net area of external elements Aum(A, m2)			102.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.6712			(33)
Main dwelling								
Party Wall 1			23.5900	0.0000	0.0000	110.0000	2594.9000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Party Ceiling 1			74.7000			30.0000	2241.0000	(32b)
Internal Wall 1			179.5900			9.0000	1616.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20791.4103 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		278.3321 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	59.7400	0.0380	2.2701
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.9800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.2109 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.8821 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff													
	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	76.3121	(39)
Average = Sum(39)m / 12 =												76.3121	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	1.0216	(40)
HLP (average)												1.0216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3546	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day)	119.4615	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	

Distribution loss (46)m = 0.15 x (45)m

30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)
Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
232.7740 205.4512 217.2344 188.5294 181.0806 161.3476 157.9091 165.1933 168.1293 189.6616 204.3430 229.9074 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
Output from w/h
232.7740 205.4512 217.2344 188.5294 181.0806 161.3476 157.9091 165.1933 168.1293 189.6616 204.3430 229.9074 (64)
Total per year (kWh/year) = Sum(64)m = 2301.5609 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
68.4360 60.2184 63.2691 54.0138 51.2480 44.9758 43.5434 45.9654 47.2307 54.1011 59.2718 67.4829 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
24.3964 21.6687 17.6222 13.3411 9.9726 8.4193 9.0974 11.8251 15.8716 20.1527 23.5212 25.0745 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
310.4616 313.6832 305.5649 288.2818 266.4650 245.9603 232.2619 229.0403 237.1587 254.4418 276.2585 296.7632 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
51.4824 51.4824 51.4824 51.4824 51.4824 51.4824 51.4824 51.4824 51.4824 51.4824 51.4824 51.4824 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-94.1850 -94.1850 -94.1850 -94.1850 -94.1850 -94.1850 -94.1850 -94.1850 -94.1850 -94.1850 -94.1850 -94.1850 (71)
Water heating gains (Table 5)
91.9839 89.6108 85.0391 75.0191 68.8817 62.4664 58.5261 61.7815 65.5982 72.7166 82.3219 90.7028 (72)
Total internal gains
525.4168 523.5376 506.8010 475.2169 443.8942 415.4210 398.4603 401.2218 417.2035 445.8859 480.6765 511.1154 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(81)
South	2.7200	54.2217	0.3300	0.0000	0.7700	37.4754	(78)
Northwest	9.7900	13.7804	0.3300	0.0000	0.7700	34.2807	(81)

Solar gains	90.7348	148.7325	238.5650	362.6895	451.3625	499.7020	466.4379	395.8083	297.4681	187.0402	109.8532	76.2642	(83)
Total gains	616.1517	672.2701	745.3660	837.9064	895.2567	915.1230	864.8982	797.0301	714.6716	632.9261	590.5297	587.3796	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	75.6812	
alpha	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	6.0454	
util living area	0.9917	0.9846	0.9578	0.8627	0.6659	0.4321	0.2910	0.3253	0.6244	0.9093	0.9819	0.9935	(86)
MIT	20.1893	20.3194	20.5640	20.8328	20.9704	20.9981	20.9999	20.9997	20.9843	20.7988	20.4452	20.1524	(87)
Th 2	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	20.0654	(88)
util rest of house	0.9888	0.9792	0.9434	0.8230	0.5983	0.3552	0.2087	0.2360	0.5348	0.8715	0.9744	0.9912	(89)
MIT 2	19.1452	19.3090	19.6105	19.9166	20.0461	20.0647	20.0654	20.0653	20.0578	19.8891	19.4690	19.0985	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	19.4962	19.6487	19.9310	20.2245	20.3568	20.3784	20.3795	20.3794	20.3693	20.1949	19.7972	19.4528	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4962	19.6487	19.9310	20.2245	20.3568	20.3784	20.3795	20.3794	20.3693	20.1949	19.7972	19.4528	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9762	0.9409	0.8303	0.6200	0.3811	0.2364	0.2661	0.5647	0.8775	0.9717	0.9891	(94)
Useful gains	607.8068	656.2472	701.3005	695.7521	555.0762	348.7490	204.4523	212.0526	403.5629	555.3906	573.7947	581.0021	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1098.6049	1064.4513	956.2690	787.8881	569.0452	349.3901	204.4778	212.1047	409.7395	663.5285	900.2658	1095.2893	(97)
Space heating kWh	365.1538	274.3131	189.6966	66.3379	10.3930	0.0000	0.0000	0.0000	0.0000	80.4546	235.0592	382.6296	(98a)
Space heating requirement - total per year (kWh/year)												1604.0378	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	365.1538	274.3131	189.6966	66.3379	10.3930	0.0000	0.0000	0.0000	0.0000	80.4546	235.0592	382.6296	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1604.0378	
Space heating per m2											(98c) / (4) =	21.4731	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	365.1538	274.3131	189.6966	66.3379	10.3930	0.0000	0.0000	0.0000	0.0000	80.4546	235.0592	382.6296	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	365.1538	274.3131	189.6966	66.3379	10.3930	0.0000	0.0000	0.0000	0.0000	80.4546	235.0592	382.6296	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1604.0378	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	709.2200	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2533.9348	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1604.0378	27.6700	443.8372	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	27.6700	196.2412	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	27.6700	13.3750	(249)
Energy for lighting	172.3395	27.6700	47.6863	(250)
Additional standing charges			0.0000	(251)
Total energy cost			701.1398	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1604.0378	0.1572	252.0963	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			352.2261	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			383.8051	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1604.0378	1.5818	2537.3166	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			3616.7903	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			3954.2554	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-42	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-42
Plot Address	Flat 15, 3 Carters Close, Reading, RG1 8GR	**SAP Version**	10.2

SAP Rating	82 B	**DER**	5.62	**TER**	13.12
Environmental	96 A	**% DER < TER**			57.16
CO_2 Emissions (t/year)	0.26	**DFEE**	30.69	**TFEE**	29.16
Compliance Check	See BREL	**% DFEE < TFEE**			-5.25
% DPER < TPER	16.84	**DPER**	58.00	**TPER**	69.75

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	22.98 m	55.10 m²	2.55 m

8.0 Living Area	24.07	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	61.03	46.35	0.00	None	14.68	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	12.03	9.88	0.90	Stairwell Access Corridor 4	2.15	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	10.86	10.86	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	24.32	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	122.68

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	55.10

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	55.10

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.15	
Patio Door	Patio Door	Brickwork	South	6.50	
S	Window	Brickwork	South	5.45	
NE	Window	Brickwork	North East	2.72	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	41.46	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	15.90	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	9.54	-0.10	-0.10	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	7.14	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	23.40	0.02	0.02	RCD	Yes
E18 Party wall between dwellings	Gov Approved Scheme	3.18	0.04	0.04	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.30	0.33	0.33	AbbeyCalculated	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	8.96	0.00	0.02		No
E25 Staggered party wall between dwellings	Non Gov Approved Schemes	3.18	0.03	0.03	RCD	No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No
22.0 Pressure Testing	Yes

Summary for Input Data

elmhurst energy

Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.85	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	6
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1: SAP table

Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	

25.0 Main Heating 2: Database

Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	

26.0 Heat Networks: None

27.0 Secondary Heating: None

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder: Internal Store

Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro: None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-42	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-42
Plot Address	Flat 15, 3 Carters Close, Reading, RG1 8GR	**SAP Version**	10.2

SAP Rating	82 B	**DER**	5.62	**TER**	13.12
Environmental	96 A	**% DER < TER**			57.16
CO_2 Emissions (t/year)	0.26	**DFEE**	30.69	**TFEE**	29.16
Compliance Check	See BREL	**% DFEE < TFEE**			-5.25
% DPER < TPER	16.84	**DPER**	58.00	**TPER**	69.75

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.5050	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.8500 (17)
Infiltration rate		0.1925 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1636 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2086	0.2045	0.2004	0.1800	0.1759	0.1554	0.1554	0.1514	0.1636	0.1759	0.1841	0.1923	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	61.0300	14.6700	46.3600	0.2100	9.7356	110.0000	5099.5999	(29a)
Communal Wall	12.0300	2.1500	9.8800	0.2000	1.9760	110.0000	1086.8000	(29a)
Stairwell Wall	10.8600		10.8600	0.1600	1.7376	110.0000	1194.6000	(29a)
Total net area of external elements Aum(A, m2)			83.9200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8269			(33)
Main dwelling								
Party Wall 1			24.3200	0.0000	0.0000	110.0000	2675.2000	(32)
Party Floor 1			55.1000			70.0000	3857.0000	(32d)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16670.3198 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		302.5466 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.4600	0.0380	1.5755
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	3.1800	0.0380	0.1208
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8785 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.7054 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	(39)
Average = Sum(39)m / 12 =												59.8888	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	(40)
HLP (average)												1.0869	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)
Hot water usage for baths	23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)
Hot water usage for other uses	33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)
Average daily hot water use (litres/day)												103.2837	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
										Total per year (kWh/year) = Sum(64)m =		2032.8510	(64)
12Total per year (kWh/year)												2033	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9252	89.5958	80.9252	83.6227	80.9252	83.6227	80.9252	80.9252	83.6227	80.9252	83.6227	80.9252	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains	371.4998	379.7838	362.9654	348.0681	328.7897	315.3442	302.1606	303.3100	313.5027	325.8913	348.1680	363.3129	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	46.7521	0.3300	0.0000	0.7700	77.2180	(78)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
South	5.4500	46.7521	0.3300	0.0000	0.7700	64.7444	(78)

Solar gains	149.7606	248.3714	324.7600	381.6941	411.9394	402.9853	390.9424	368.7080	344.2235	270.1694	178.0861	129.0370	(83)
Total gains	521.2604	628.1552	687.7255	729.7622	740.7291	718.3295	693.1030	672.0180	657.7262	596.0607	526.2541	492.3499	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	
alpha	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	
util living area	0.9912	0.9738	0.9390	0.8572	0.7148	0.5283	0.3796	0.4089	0.6144	0.8784	0.9773	0.9937	(86)
MIT	20.1854	20.4061	20.6249	20.8330	20.9537	20.9936	20.9993	20.9989	20.9846	20.8328	20.4639	20.1291	(87)
Th 2	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	(88)
util rest of house	0.9881	0.9651	0.9198	0.8176	0.6517	0.4493	0.2947	0.3216	0.5327	0.8351	0.9681	0.9913	(89)
MIT 2	19.0907	19.3656	19.6296	19.8628	19.9791	20.0087	20.0114	20.0112	20.0036	19.8691	19.4412	19.0195	(90)
Living area fraction									fLA = Living area / (4) =			0.4368	(91)
MIT	19.5689	19.8201	20.0644	20.2866	20.4048	20.4389	20.4429	20.4427	20.4322	20.2901	19.8880	19.5042	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5689	19.8201	20.0644	20.2866	20.4048	20.4389	20.4429	20.4427	20.4322	20.2901	19.8880	19.5042	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9631	0.9209	0.8295	0.6777	0.4838	0.3318	0.3598	0.5682	0.8485	0.9666	0.9898	(94)
Useful gains	514.0828	604.9690	633.3582	605.3041	501.9821	347.5374	229.9746	241.8215	373.7012	505.7364	508.7022	487.3177	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	914.4374	893.5479	812.3563	681.9313	521.3224	349.6864	230.1484	242.1109	379.2261	580.3250	765.8548	916.5505	(97)
Space heating kWh	297.8639	193.9250	133.1746	55.1716	14.3892	0.0000	0.0000	0.0000	0.0000	55.4939	185.1498	319.3492	(98a)
Space heating requirement - total per year (kWh/year)												1254.5173	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	297.8639	193.9250	133.1746	55.1716	14.3892	0.0000	0.0000	0.0000	0.0000	55.4939	185.1498	319.3492	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1254.5173	
Space heating per m2											(98c) / (4) =	22.7680	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	297.8639	193.9250	133.1746	55.1716	14.3892	0.0000	0.0000	0.0000	0.0000	55.4939	185.1498	319.3492	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	297.8639	193.9250	133.1746	55.1716	14.3892	0.0000	0.0000	0.0000	0.0000	55.4939	185.1498	319.3492	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1254.5173	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.6545	(230a)
Total electricity for the above, kWh/year	35.6545	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2049.5198	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1254.5173	0.1573	197.3032	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			285.7100	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			309.8416	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1254.5173	1.5822	1984.8900	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			2938.2113	(279)
Pumps, fans and electric keep-hot	35.6545	1.5128	53.9382	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			3196.0423	(286)
Dwelling Primary energy Rate (DPER)			58.0000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1423	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3923	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3335	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4252	0.4169	0.4085	0.3668	0.3585	0.3168	0.3168	0.3085	0.3335	0.3585	0.3752	0.3919	(22b)
Effective ac	0.5904	0.5869	0.5834	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.6300	1.1450	13.3168			(27)
Brickwork	61.0300	11.6300	49.4000	0.1800	8.8920			(29a)
Communal Wall	12.0300	2.1500	9.8800	0.1800	1.7784			(29a)
Stairwell Wall	10.8600		10.8600	0.1800	1.9548			(29a)
Total net area of external elements Aum(A, m2)			83.9200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0920			(33)
Main dwelling								
Party Wall 1			24.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 302.5466 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.4600	0.0700	2.9022
E16 Corner (normal)	15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0900	-0.8586
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0500	1.1700
E18 Party wall between dwellings	3.1800	0.0600	0.1908
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E25 Staggered party wall between dwellings	3.1800	0.0600	0.1908

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4692 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 33.5612 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3748	27.2120	27.0525	26.3032	26.1630	25.5103	25.5103	25.3895	25.7617	26.1630	26.4466	26.7431	(38)
Heat transfer coeff	60.9360	60.7732	60.6137	59.8644	59.7242	59.0715	59.0715	58.9506	59.3229	59.7242	60.0078	60.3043	(39)
Average = Sum(39)m / 12 =												59.8637	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1059	1.1030	1.1001	1.0865	1.0839	1.0721	1.0721	1.0699	1.0766	1.0839	1.0891	1.0945	(40)
HLP (average)												1.0865	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5439	198.6677	211.1098	185.5406	179.8522	162.0402	159.8182	166.1156	167.9022	187.2699	199.2117	222.0653	(62)
WWHRS	-25.1780	-22.2677	-23.3174	-19.3077	-17.9941	-15.3977	-14.4329	-15.3479	-15.9311	-18.7810	-21.2765	-24.7118	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
									Total per year (kWh/year) = Sum(64)m =			2030.1935	(64)
12Total per year (kWh/year)												2030	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	96.4440	85.7321	91.9771	82.7727	81.5840	74.9588	74.9227	77.0166	76.9079	84.0504	87.3183	95.6198	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.1190	89.8104	81.1190	83.8230	81.1190	83.8230	81.1190	81.1190	83.8230	81.1190	83.8230	81.1190	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)

Water heating gains (Table 5)

	129.6290	127.5775	123.6252	114.9621	109.6559	104.1094	100.7025	103.5169	106.8166	112.9709	121.2755	128.5213 (72)
Total internal gains												
	424.7956	433.1004	416.2613	401.3704	382.0856	365.6465	352.4564	353.6059	363.8050	379.1871	401.4703	416.6088 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1600	11.2829	0.6300	0.7000	0.7700	7.4481	(75)
South	9.4700	46.7521	0.6300	0.7000	0.7700	135.3077	(78)

Solar gains	142.7559	236.7601	309.5932	363.8948	392.7544	384.2283	372.7413	351.5238	328.1567	257.5433	169.7575	123.0009 (83)
Total gains	567.5515	669.8605	725.8545	765.2652	774.8400	749.8748	725.1978	705.1297	691.9617	636.7305	571.2278	539.6096 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.9919	76.1955	76.3960	77.3523	77.5339	78.3905	78.3905	78.5512	78.0583	77.5339	77.1674	76.7880	
alpha	6.0661	6.0797	6.0931	6.1568	6.1689	6.2260	6.2260	6.2367	6.2039	6.1689	6.1445	6.1192	
util living area													
	0.9870	0.9662	0.9269	0.8356	0.6882	0.5006	0.3580	0.3840	0.5820	0.8496	0.9670	0.9900	(86)
MIT	20.2315	20.4433	20.6535	20.8569	20.9626	20.9955	20.9995	20.9993	20.9889	20.8649	20.5255	20.1941	(87)
Th 2	19.9960	19.9984	20.0008	20.0119	20.0140	20.0237	20.0237	20.0255	20.0200	20.0140	20.0098	20.0054	(88)
util rest of house													
	0.9824	0.9553	0.9050	0.7935	0.6254	0.4260	0.2788	0.3030	0.5038	0.8018	0.9544	0.9864	(89)
MIT 2	19.1362	19.3997	19.6525	19.8866	19.9881	20.0217	20.0236	20.0253	20.0143	19.9021	19.5138	19.0965	(90)
Living area fraction										fLA = Living area / (4) =		0.4368	(91)
MIT	19.6147	19.8556	20.0897	20.3104	20.4138	20.4471	20.4499	20.4508	20.4401	20.3227	19.9557	19.5760	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6147	19.8556	20.0897	20.3104	20.4138	20.4471	20.4499	20.4508	20.4401	20.3227	19.9557	19.5760	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9802	0.9535	0.9072	0.8070	0.6516	0.4586	0.3134	0.3384	0.5378	0.8179	0.9536	0.9844	(94)
Useful gains	556.3289	638.7163	658.4821	617.5860	504.8593	343.8985	227.3063	238.6117	372.1522	520.7921	544.7337	531.2167	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	933.2148	908.8982	823.7247	683.0788	520.4245	345.3972	227.4206	238.7961	376.1108	580.6783	771.4442	927.2379	(97)
Space heating kWh													
	280.4031	181.5623	122.9405	47.1548	11.5805	0.0000	0.0000	0.0000	0.0000	44.5553	163.2316	294.6398	(98a)
Space heating requirement - total per year (kWh/year)												1146.0678	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	280.4031	181.5623	122.9405	47.1548	11.5805	0.0000	0.0000	0.0000	0.0000	44.5553	163.2316	294.6398	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1146.0678	
Space heating per m2											(98c) / (4) =	20.7998	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	280.4031	181.5623	122.9405	47.1548	11.5805	0.0000	0.0000	0.0000	0.0000	44.5553	163.2316	294.6398	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	303.7953	196.7088	133.1967	51.0886	12.5466	0.0000	0.0000	0.0000	0.0000	48.2723	176.8489	319.2197	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8246	84.1245	83.1336	81.6282	80.3437	79.8000	79.8000	79.8000	79.8000	81.5281	83.8668	84.9565	(217)
Fuel for water heating, kWh/month													
	235.0330	209.6891	225.8923	203.6464	201.4570	183.7625	182.1872	188.9319	190.4401	206.6636	212.1639	232.2994	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8549	13.5217	12.1747	8.9197	6.8899	5.6291	6.2852	8.1697	10.6116	13.9230	15.7260	17.3234	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.8812	-22.1119	-33.4855	-39.7436	-44.7182	-42.4426	-41.9424	-38.6757	-33.2316	-26.2086	-16.7630	-12.7382	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-5.2881	-11.3757	-23.0800	-35.3581	-47.4275	-47.8846	-47.3043	-39.7286	-28.7089	-16.4757	-7.1278	-4.1621 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1241.6769	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2472.1665	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	136.0290	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-680.8639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3255.0084	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1241.6769	0.2100	260.7521	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2472.1665	0.2100	519.1550	(264)
Space and water heating			779.9071	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.0290	0.1443	19.6332	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9425	0.1335	-48.9795	
PV Unit electricity exported	-313.9214	0.1253	-39.3435	
Total			-88.3230	(269)
Total CO2, kg/year			723.1466	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.1200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1241.6769	1.1300	1403.0949	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2472.1665	1.1300	2793.5481	(278)
Space and water heating			4196.6430	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.0290	1.5338	208.6458	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9425	1.4933	-547.9393	
PV Unit electricity exported	-313.9214	0.4600	-144.4093	
Total			-692.3487	(283)
Total Primary energy kWh/year			3843.0409	(286)
Target Primary Energy Rate (TPER)			69.7500	(287)

Full SAP Calculation Printout

Plot Reference	P-42	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-42
Plot Address	Flat 15, 3 Carters Close, Reading, RG1 8GR	**SAP Version**	10.2

SAP Rating	82 B	**DER**	5.62	**TER**	13.12
Environmental	96 A	**% DER < TER**			57.16
CO_2 Emissions (t/year)	0.26	**DFEE**	30.69	**TFEE**	29.16
Compliance Check	See BREL	**% DFEE < TFEE**			-5.25
% DPER < TPER	16.84	**DPER**	58.00	**TPER**	69.75

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1423	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8500	(17)
Infiltration rate		0.3348	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2846	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3629	0.3558	0.3487	0.3131	0.3060	0.2704	0.2704	0.2633	0.2846	0.3060	0.3202	0.3344	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5658	0.5633	0.5608	0.5490	0.5468	0.5366	0.5366	0.5347	0.5405	0.5468	0.5513	0.5559	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	61.0300	14.6700	46.3600	0.2100	9.7356	110.0000	5099.5999	(29a)
Communal Wall	12.0300	2.1500	9.8800	0.2000	1.9760	110.0000	1086.8000	(29a)
Stairwell Wall	10.8600		10.8600	0.1600	1.7376	110.0000	1194.6000	(29a)
Total net area of external elements Aum(A, m2)			83.9200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8269			(33)
Main dwelling								
Party Wall 1			24.3200	0.0000	0.0000	110.0000	2675.2000	(32)
Party Floor 1			55.1000			70.0000	3857.0000	(32d)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16670.3198 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		302.5466 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	41.4600	0.0380	1.5755
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	3.1800	0.0380	0.1208
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8785 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.7054 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2363	26.1177	26.0015	25.4557	25.3536	24.8782	24.8782	24.7902	25.0613	25.3536	25.5602	25.7762	(38)
Heat transfer coeff	62.9417	62.8231	62.7069	62.1611	62.0590	61.5837	61.5837	61.4956	61.7668	62.0590	62.2656	62.4816	(39)

Average = Sum(39)m / 12 = 62.1607

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1423	1.1402	1.1381	1.1282	1.1263	1.1177	1.1177	1.1161	1.1210	1.1263	1.1300	1.1340	(40)
HLP (average)												1.1281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 52.5062 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.2837	55.7128	53.9976	51.8622	49.9575	47.9779	47.5662	49.2780	51.0336	53.0666	55.2208	57.2032	(44)
Energy conte	90.7234	79.3343	82.9923	70.9968	67.2524	58.9945	57.5272	61.0164	62.9295	72.0108	78.6722	89.5665	(45)

Energy content (annual) Total = Sum(45)m = 872.0164

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(64)

Total per year (kWh/year) = Sum(64)m = 741.2139 (64)

12Total per year (kWh/year) 741 (64)

Electric shower(s)

44.1060	39.2988	42.9128	40.9511	41.7196	39.7964	41.1230	41.7196	40.9511	42.9128	42.1059	44.1060	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 501.7031 (64a)

Heat gains from water heating, kWh/month

30.3052	26.6832	28.3641	25.3246	24.7210	22.4854	22.5053	23.3959	23.6103	26.0305	27.2443	30.0594	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9252	89.5958	80.9252	83.6227	80.9252	83.6227	80.9252	80.9252	83.6227	80.9252	83.6227	80.9252	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	40.7328	39.7072	38.1237	35.1731	33.2272	31.2298	30.2490	31.4461	32.7921	34.9872	37.8393	40.4024	(72)
Total internal gains	332.7057	342.0155	327.5660	318.3811	302.4631	292.5666	281.8091	281.3413	289.5803	298.0096	314.8339	325.2961	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	46.7521	0.3300	0.0000	0.7700	77.2180	(78)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
South	5.4500	46.7521	0.3300	0.0000	0.7700	64.7444	(78)

Solar gains	149.7606	248.3714	324.7600	381.6941	411.9394	402.9853	390.9424	368.7080	344.2235	270.1694	178.0861	129.0370	(83)
Total gains	482.4663	590.3869	652.3261	700.0752	714.4025	695.5518	672.7515	650.0492	633.8038	568.1791	492.9200	454.3331	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.5704	73.7092	73.8458	74.4942	74.6168	75.1927	75.1927	75.3004	74.9698	74.6168	74.3692	74.1122	
alpha	5.9047	5.9139	5.9231	5.9663	5.9745	6.0128	6.0128	6.0200	5.9980	5.9745	5.9579	5.9408	
util living area	0.9945	0.9823	0.9561	0.8853	0.7518	0.5584	0.4018	0.4335	0.6507	0.9051	0.9847	0.9961	(86)
MIT	20.0458	20.2790	20.5227	20.7784	20.9330	20.9904	20.9989	20.9982	20.9769	20.7804	20.3638	20.0013	(87)
Th 2	19.9664	19.9682	19.9699	19.9779	19.9794	19.9864	19.9864	19.9877	19.9837	19.9794	19.9764	19.9732	(88)
util rest of house	0.9924	0.9760	0.9408	0.8493	0.6879	0.4740	0.3098	0.3391	0.5645	0.8668	0.9780	0.9946	(89)
MIT 2	19.1192	19.3493	19.5839	19.8205	19.9419	19.9830	19.9862	19.9874	19.9743	19.8294	19.4414	19.0806	(90)
Living area fraction										fLA = Living area / (4) =		0.4368	(91)
MIT	19.5239	19.7554	19.9940	20.2389	20.3749	20.4231	20.4286	20.4289	20.4123	20.2448	19.8444	19.4828	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5239	19.7554	19.9940	20.2389	20.3749	20.4231	20.4286	20.4289	20.4123	20.2448	19.8444	19.4828	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9744	0.9412	0.8593	0.7138	0.5109	0.3501	0.3804	0.6019	0.8779	0.9770	0.9936	(94)
Useful gains	478.2628	575.2900	613.9935	601.6027	509.9320	355.3407	235.4977	247.3007	381.4692	498.8225	481.5624	451.4291	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	958.2205	933.2648	846.1668	704.8407	538.3530	358.6071	235.7779	247.7623	389.8890	598.5481	793.5354	954.8943	(97)
Space heating kWh	357.0885	240.5591	172.7369	74.3314	21.1452	0.0000	0.0000	0.0000	0.0000	74.1958	224.6205	374.5781	(98a)
Space heating requirement - total per year (kWh/year)												1539.2556	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	357.0885	240.5591	172.7369	74.3314	21.1452	0.0000	0.0000	0.0000	0.0000	74.1958	224.6205	374.5781	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.2556	
Space heating per m2											(98c) / (4) =	27.9357	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	578.8864	455.7191	467.3668	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9520	0.9808	0.9749	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	551.0913	446.9823	455.6397	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	783.7360	758.6834	733.7013	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	167.5041	231.9056	206.8778	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.8760	57.9764	51.7195	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												151.5719	(107)
Energy for space heating												27.9357	(99)
Energy for space cooling												2.7509	(108)
Total												30.6865	(109)
Fabric Energy Efficiency (DFEE)												30.7	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											20.0000 / (5) =	0.1423	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000	(17)
Infiltration rate												0.3923	(18)
Number of sides sheltered												2	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3335	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4252	0.4169	0.4085	0.3668	0.3585	0.3168	0.3168	0.3085	0.3335	0.3585	0.3752	0.3919	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5904	0.5869	0.5834	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.6300	1.1450	13.3168			(27)
Brickwork	61.0300	11.6300	49.4000	0.1800	8.8920			(29a)
Communal Wall	12.0300	2.1500	9.8800	0.1800	1.7784			(29a)
Stairwell Wall	10.8600		10.8600	0.1800	1.9548			(29a)
Total net area of external elements Aum(A, m2)			83.9200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.0920			(33)
Main dwelling								
Party Wall 1			24.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	302.5466	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.4600	0.0700	2.9022
E16 Corner (normal)	15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0900	-0.8586
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0500	1.1700
E18 Party wall between dwellings	3.1800	0.0600	0.1908
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E25 Staggered party wall between dwellings	3.1800	0.0600	0.1908

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.4692	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	33.5612	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3748	27.2120	27.0525	26.3032	26.1630	25.5103	25.5103	25.3895	25.7617	26.1630	26.4466	26.7431	(38)
Heat transfer coeff	60.9360	60.7732	60.6137	59.8644	59.7242	59.0715	59.0715	58.9506	59.3229	59.7242	60.0078	60.3043	(39)
Average = Sum(39)m / 12 =												59.8637	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1059	1.1030	1.1001	1.0865	1.0839	1.0721	1.0721	1.0699	1.0766	1.0839	1.0891	1.0945	(40)
HLP (average)												1.0865	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8403	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

	33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day)	52.5062	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.2837	55.7128	53.9976	51.8622	49.9575	47.9779	47.5662	49.2780	51.0336	53.0666	55.2208	57.2032	(44)
Energy conte	90.7234	79.3343	82.9923	70.9968	67.2524	58.9945	57.5272	61.0164	62.9295	72.0108	78.6722	89.5665	(45)

Energy content (annual) Total = Sum(45)m =	872.0164	
Distribution loss (46)m = 0.15 x (45)m		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	77.1149	67.4342	70.5435	60.3473	57.1645	50.1453	48.8981	51.8639	53.4901	61.2092	66.8714	76.1315	(64)

Total per year (kWh/year) = Sum(64)m =	741.2139	(64)
12Total per year (kWh/year)	741	(64)

Electric shower(s)

	44.1060	39.2988	42.9128	40.9511	41.7196	39.7964	41.1230	41.7196	40.9511	42.9128	42.1059	44.1060	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	501.7031	(64a)

Heat gains from water heating, kWh/month

	30.3052	26.6832	28.3641	25.3246	24.7210	22.4854	22.5053	23.3959	23.6103	26.0305	27.2443	30.0594	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.1190	89.8104	81.1190	83.8230	81.1190	83.8230	81.1190	81.1190	83.8230	81.1190	83.8230	81.1190	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)													
	40.7328	39.7072	38.1237	35.1731	33.2272	31.2298	30.2490	31.4461	32.7921	34.9872	37.8393	40.4024	(72)
Total internal gains													
	332.8995	342.2301	327.7598	318.5814	302.6569	292.7668	282.0029	281.5351	289.7806	298.2034	315.0342	325.4899	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1600	11.2829	0.6300	0.7000	0.7700	7.4481	(75)
South	9.4700	46.7521	0.6300	0.7000	0.7700	135.3077	(78)

Solar gains	142.7559	236.7601	309.5932	363.8948	392.7544	384.2283	372.7413	351.5238	328.1567	257.5433	169.7575	123.0009	(83)
Total gains	475.6554	578.9902	637.3530	682.4762	695.4113	676.9951	654.7443	633.0589	617.9373	555.7468	484.7917	448.4907	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.9919	76.1955	76.3960	77.3523	77.5339	78.3905	78.3905	78.5512	78.0583	77.5339	77.1674	76.7880	
alpha	6.0661	6.0797	6.0931	6.1568	6.1689	6.2260	6.2260	6.2367	6.2039	6.1689	6.1445	6.1192	
util living area													
	0.9947	0.9828	0.9568	0.8845	0.7485	0.5518	0.3962	0.4271	0.6441	0.9035	0.9848	0.9962	(86)
MIT	20.0853	20.3119	20.5476	20.7966	20.9411	20.9924	20.9992	20.9987	20.9809	20.7994	20.3992	20.0469	(87)
Th 2	19.9960	19.9984	20.0008	20.0119	20.0140	20.0237	20.0237	20.0255	20.0200	20.0140	20.0098	20.0054	(88)
util rest of house													
	0.9927	0.9767	0.9419	0.8490	0.6860	0.4709	0.3087	0.3374	0.5608	0.8655	0.9782	0.9947	(89)
MIT 2	19.1825	19.4066	19.6342	19.8674	19.9811	20.0210	20.0235	20.0252	20.0121	19.8770	19.5037	19.1521	(90)
Living area fraction									fLA = Living area / (4) =			0.4368	(91)
MIT	19.5769	19.8021	20.0332	20.2733	20.4005	20.4453	20.4497	20.4505	20.4353	20.2799	19.8949	19.5430	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5769	19.8021	20.0332	20.2733	20.4005	20.4453	20.4497	20.4505	20.4353	20.2799	19.8949	19.5430	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9916	0.9752	0.9425	0.8592	0.7115	0.5062	0.3470	0.3766	0.5970	0.8769	0.9773	0.9938	(94)
Useful gains	471.6610	564.6261	600.6819	586.4168	494.7878	342.7151	227.2043	238.4376	368.9032	487.3374	473.7843	445.7252	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	930.9120	905.6485	820.2975	680.8562	519.6284	345.2928	227.4095	238.7779	375.8305	578.1268	767.7935	925.2493	(97)
Space heating kWh													
	341.6828	229.1670	163.3940	67.9963	18.4814	0.0000	0.0000	0.0000	0.0000	67.5473	211.6866	356.7660	(98a)
Space heating requirement - total per year (kWh/year)												1456.7215	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	341.6828	229.1670	163.3940	67.9963	18.4814	0.0000	0.0000	0.0000	0.0000	67.5473	211.6866	356.7660	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1456.7215	
Space heating per m2										(98c) / (4) =		26.4378	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	555.2722	437.1291	448.0249	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9579	0.9839	0.9789	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	531.8768	430.1067	438.5546	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	761.8292	737.4278	713.6397	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	165.5657	228.6469	204.6634	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	41.3914	57.1617	51.1658	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												149.7190	(107)
Energy for space heating												26.4378	(99)
Energy for space cooling												2.7172	(108)
Total												29.1550	(109)
Fabric Energy Efficiency (TFEE)												29.2	(109)

Full SAP Calculation Printout

Plot Reference	P-42	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-42
Plot Address	Flat 15, 3 Carters Close, Reading, RG1 8GR	**SAP Version**	10.2

SAP Rating	82 B	**DER**	5.62	**TER**	13.12
Environmental	96 A	**% DER < TER**			57.16
CO_2 Emissions (t/year)	0.26	**DFEE**	30.69	**TFEE**	29.16
Compliance Check	See BREL	**% DFEE < TFEE**			-5.25
% DPER < TPER	16.84	**DPER**	58.00	**TPER**	69.75

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.5050	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.8500 (17)
Infiltration rate		0.1925 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1636 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2086	0.2045	0.2004	0.1800	0.1759	0.1554	0.1554	0.1514	0.1636	0.1759	0.1841	0.1923	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	61.0300	14.6700	46.3600	0.2100	9.7356	110.0000	5099.5999	(29a)
Communal Wall	12.0300	2.1500	9.8800	0.2000	1.9760	110.0000	1086.8000	(29a)
Stairwell Wall	10.8600		10.8600	0.1600	1.7376	110.0000	1194.6000	(29a)
Total net area of external elements Aum(A, m2)			83.9200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8269			(33)
Main dwelling								
Party Wall 1			24.3200	0.0000	0.0000	110.0000	2675.2000	(32)
Party Floor 1			55.1000			70.0000	3857.0000	(32d)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16670.3198 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		302.5466 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.4600	0.0380	1.5755
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	3.1800	0.0380	0.1208
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8785 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.7054 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	(39)
Average = Sum(39)m / 12 =												59.8888	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	(40)
HLP (average)												1.0869	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)
Hot water usage for baths	23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)
Hot water usage for other uses	33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)
Average daily hot water use (litres/day)												103.2837	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
										Total per year (kWh/year) = Sum(64)m =		2032.8510	(64)
12Total per year (kWh/year)												2033	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9252	89.5958	80.9252	83.6227	80.9252	83.6227	80.9252	80.9252	83.6227	80.9252	83.6227	80.9252	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains	371.4998	379.7838	362.9654	348.0681	328.7897	315.3442	302.1606	303.3100	313.5027	325.8913	348.1680	363.3129	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	46.7521	0.3300	0.0000	0.7700	77.2180	(78)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
South	5.4500	46.7521	0.3300	0.0000	0.7700	64.7444	(78)

Solar gains	149.7606	248.3714	324.7600	381.6941	411.9394	402.9853	390.9424	368.7080	344.2235	270.1694	178.0861	129.0370	(83)
Total gains	521.2604	628.1552	687.7255	729.7622	740.7291	718.3295	693.1030	672.0180	657.7262	596.0607	526.2541	492.3499	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	
alpha	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	
util living area	0.9912	0.9738	0.9390	0.8572	0.7148	0.5283	0.3796	0.4089	0.6144	0.8784	0.9773	0.9937	(86)
MIT	20.1854	20.4061	20.6249	20.8330	20.9537	20.9936	20.9993	20.9989	20.9846	20.8328	20.4639	20.1291	(87)
Th 2	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	(88)
util rest of house	0.9881	0.9651	0.9198	0.8176	0.6517	0.4493	0.2947	0.3216	0.5327	0.8351	0.9681	0.9913	(89)
MIT 2	19.0907	19.3656	19.6296	19.8628	19.9791	20.0087	20.0114	20.0112	20.0036	19.8691	19.4412	19.0195	(90)
Living area fraction									fLA = Living area / (4) =			0.4368	(91)
MIT	19.5689	19.8201	20.0644	20.2866	20.4048	20.4389	20.4429	20.4427	20.4322	20.2901	19.8880	19.5042	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5689	19.8201	20.0644	20.2866	20.4048	20.4389	20.4429	20.4427	20.4322	20.2901	19.8880	19.5042	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9631	0.9209	0.8295	0.6777	0.4838	0.3318	0.3598	0.5682	0.8485	0.9666	0.9898	(94)
Useful gains	514.0828	604.9690	633.3582	605.3041	501.9821	347.5374	229.9746	241.8215	373.7012	505.7364	508.7022	487.3177	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	914.4374	893.5479	812.3563	681.9313	521.3224	349.6864	230.1484	242.1109	379.2261	580.3250	765.8548	916.5505	(97)
Space heating kWh	297.8639	193.9250	133.1746	55.1716	14.3892	0.0000	0.0000	0.0000	0.0000	55.4939	185.1498	319.3492	(98a)
Space heating requirement - total per year (kWh/year)												1254.5173	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	297.8639	193.9250	133.1746	55.1716	14.3892	0.0000	0.0000	0.0000	0.0000	55.4939	185.1498	319.3492	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1254.5173	
Space heating per m2											(98c) / (4) =	22.7680	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	297.8639	193.9250	133.1746	55.1716	14.3892	0.0000	0.0000	0.0000	0.0000	55.4939	185.1498	319.3492	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	297.8639	193.9250	133.1746	55.1716	14.3892	0.0000	0.0000	0.0000	0.0000	55.4939	185.1498	319.3492	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1254.5173	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.6545	(230a)
Total electricity for the above, kWh/year	35.6545	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2049.5198	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1254.5173	0.1573	197.3032	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			285.7100	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			309.8416	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1254.5173	1.5822	1984.8900	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			2938.2113	(279)
Pumps, fans and electric keep-hot	35.6545	1.5128	53.9382	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			3196.0423	(286)
Dwelling Primary energy Rate (DPER)			58.0000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1423	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3923	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3335	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4252	0.4169	0.4085	0.3668	0.3585	0.3168	0.3168	0.3085	0.3335	0.3585	0.3752	0.3919	(22b)
Effective ac	0.5904	0.5869	0.5834	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.6300	1.1450	13.3168			(27)
Brickwork	61.0300	11.6300	49.4000	0.1800	8.8920			(29a)
Communal Wall	12.0300	2.1500	9.8800	0.1800	1.7784			(29a)
Stairwell Wall	10.8600		10.8600	0.1800	1.9548			(29a)
Total net area of external elements Aum(A, m2)			83.9200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0920			(33)
Main dwelling								
Party Wall 1			24.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 302.5466 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.4600	0.0700	2.9022
E16 Corner (normal)	15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0900	-0.8586
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0500	1.1700
E18 Party wall between dwellings	3.1800	0.0600	0.1908
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E25 Staggered party wall between dwellings	3.1800	0.0600	0.1908

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4692 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 33.5612 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.3748	27.2120	27.0525	26.3032	26.1630	25.5103	25.5103	25.3895	25.7617	26.1630	26.4466	26.7431	(38)
Heat transfer coeff	60.9360	60.7732	60.6137	59.8644	59.7242	59.0715	59.0715	58.9506	59.3229	59.7242	60.0078	60.3043	(39)
Average = Sum(39)m / 12 =												59.8637	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1059	1.1030	1.1001	1.0865	1.0839	1.0721	1.0721	1.0699	1.0766	1.0839	1.0891	1.0945	(40)
HLP (average)												1.0865	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5439	198.6677	211.1098	185.5406	179.8522	162.0402	159.8182	166.1156	167.9022	187.2699	199.2117	222.0653	(62)
WWHRS	-25.1780	-22.2677	-23.3174	-19.3077	-17.9941	-15.3977	-14.4329	-15.3479	-15.9311	-18.7810	-21.2765	-24.7118	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
									Total per year (kWh/year) = Sum(64)m =			2030.1935	(64)
12Total per year (kWh/year)												2030	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	96.4440	85.7321	91.9771	82.7727	81.5840	74.9588	74.9227	77.0166	76.9079	84.0504	87.3183	95.6198	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	92.0144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.1190	89.8104	81.1190	83.8230	81.1190	83.8230	81.1190	81.1190	83.8230	81.1190	83.8230	81.1190	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.4433	162.1082	157.9127	148.9810	137.7063	127.1097	120.0305	118.3656	122.5611	131.4928	142.7675	153.3641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	32.2014	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)

Water heating gains (Table 5)

	129.6290	127.5775	123.6252	114.9621	109.6559	104.1094	100.7025	103.5169	106.8166	112.9709	121.2755	128.5213 (72)
Total internal gains												
	424.7956	433.1004	416.2613	401.3704	382.0856	365.6465	352.4564	353.6059	363.8050	379.1871	401.4703	416.6088 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1600	11.2829	0.6300	0.7000	0.7700	7.4481	(75)
South	9.4700	46.7521	0.6300	0.7000	0.7700	135.3077	(78)

Solar gains	142.7559	236.7601	309.5932	363.8948	392.7544	384.2283	372.7413	351.5238	328.1567	257.5433	169.7575	123.0009 (83)
Total gains	567.5515	669.8605	725.8545	765.2652	774.8400	749.8748	725.1978	705.1297	691.9617	636.7305	571.2278	539.6096 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.9919	76.1955	76.3960	77.3523	77.5339	78.3905	78.3905	78.5512	78.0583	77.5339	77.1674	76.7880	
alpha	6.0661	6.0797	6.0931	6.1568	6.1689	6.2260	6.2260	6.2367	6.2039	6.1689	6.1445	6.1192	
util living area													
	0.9870	0.9662	0.9269	0.8356	0.6882	0.5006	0.3580	0.3840	0.5820	0.8496	0.9670	0.9900	(86)
MIT	20.2315	20.4433	20.6535	20.8569	20.9626	20.9955	20.9995	20.9993	20.9889	20.8649	20.5255	20.1941	(87)
Th 2	19.9960	19.9984	20.0008	20.0119	20.0140	20.0237	20.0237	20.0255	20.0200	20.0140	20.0098	20.0054	(88)
util rest of house													
	0.9824	0.9553	0.9050	0.7935	0.6254	0.4260	0.2788	0.3030	0.5038	0.8018	0.9544	0.9864	(89)
MIT 2	19.1362	19.3997	19.6525	19.8866	19.9881	20.0217	20.0236	20.0253	20.0143	19.9021	19.5138	19.0965	(90)
Living area fraction										fLA = Living area / (4) =		0.4368	(91)
MIT	19.6147	19.8556	20.0897	20.3104	20.4138	20.4471	20.4499	20.4508	20.4401	20.3227	19.9557	19.5760	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6147	19.8556	20.0897	20.3104	20.4138	20.4471	20.4499	20.4508	20.4401	20.3227	19.9557	19.5760	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9802	0.9535	0.9072	0.8070	0.6516	0.4586	0.3134	0.3384	0.5378	0.8179	0.9536	0.9844	(94)
Useful gains	556.3289	638.7163	658.4821	617.5860	504.8593	343.8985	227.3063	238.6117	372.1522	520.7921	544.7337	531.2167	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	933.2148	908.8982	823.7247	683.0788	520.4245	345.3972	227.4206	238.7961	376.1108	580.6783	771.4442	927.2379	(97)
Space heating kWh													
	280.4031	181.5623	122.9405	47.1548	11.5805	0.0000	0.0000	0.0000	0.0000	44.5553	163.2316	294.6398	(98a)
Space heating requirement - total per year (kWh/year)												1146.0678	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	280.4031	181.5623	122.9405	47.1548	11.5805	0.0000	0.0000	0.0000	0.0000	44.5553	163.2316	294.6398	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1146.0678	
Space heating per m2											(98c) / (4) =	20.7998	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	280.4031	181.5623	122.9405	47.1548	11.5805	0.0000	0.0000	0.0000	0.0000	44.5553	163.2316	294.6398	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	303.7953	196.7088	133.1967	51.0886	12.5466	0.0000	0.0000	0.0000	0.0000	48.2723	176.8489	319.2197	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	199.3658	176.4000	187.7924	166.2329	161.8580	146.6425	145.3854	150.7677	151.9712	168.4889	177.9352	197.3535	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8246	84.1245	83.1336	81.6282	80.3437	79.8000	79.8000	79.8000	79.8000	81.5281	83.8668	84.9565	(217)
Fuel for water heating, kWh/month													
	235.0330	209.6891	225.8923	203.6464	201.4570	183.7625	182.1872	188.9319	190.4401	206.6636	212.1639	232.2994	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8549	13.5217	12.1747	8.9197	6.8899	5.6291	6.2852	8.1697	10.6116	13.9230	15.7260	17.3234	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.8812	-22.1119	-33.4855	-39.7436	-44.7182	-42.4426	-41.9424	-38.6757	-33.2316	-26.2086	-16.7630	-12.7382	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-5.2881	-11.3757	-23.0800	-35.3581	-47.4275	-47.8846	-47.3043	-39.7286	-28.7089	-16.4757	-7.1278	-4.1621 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1241.6769 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2472.1665 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	136.0290 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-680.8639 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3255.0084 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1241.6769	0.2100	260.7521	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2472.1665	0.2100	519.1550	(264)
Space and water heating			779.9071	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.0290	0.1443	19.6332	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9425	0.1335	-48.9795	
PV Unit electricity exported	-313.9214	0.1253	-39.3435	
Total			-88.3230	(269)
Total CO2, kg/year			723.1466	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.1200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1241.6769	1.1300	1403.0949	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2472.1665	1.1300	2793.5481	(278)
Space and water heating			4196.6430	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.0290	1.5338	208.6458	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.9425	1.4933	-547.9393	
PV Unit electricity exported	-313.9214	0.4600	-144.4093	
Total			-692.3487	(283)
Total Primary energy kWh/year			3843.0409	(286)
Target Primary Energy Rate (TPER)			69.7500	(287)

Full SAP Calculation Printout

Plot Reference	P-42	Issued on Date	24/04/2026
Assessment Reference	As Built	Plot Type Ref	P-42
Plot Address	Flat 15, 3 Carters Close, Reading, RG1 8GR	SAP Version	10.2

SAP Rating	82 B	DER	5.62	TER	13.12
Environmental	96 A	% DER < TER			57.16
CO_2 Emissions (t/year)	0.26	DFEE	30.69	TFEE	29.16
Compliance Check	See BREL	% DFEE < TFEE			-5.25
% DPER < TPER	16.84	DPER	58.00	TPER	69.75

Assessor Details	Mr. Matthew Fitzpatrick	Assessor ID	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.5050	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8500	(17)
Infiltration rate		0.1925	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1636	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2086	0.2045	0.2004	0.1800	0.1759	0.1554	0.1554	0.1514	0.1636	0.1759	0.1841	0.1923	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	61.0300	14.6700	46.3600	0.2100	9.7356	110.0000	5099.5999	(29a)
Communal Wall	12.0300	2.1500	9.8800	0.2000	1.9760	110.0000	1086.8000	(29a)
Stairwell Wall	10.8600		10.8600	0.1600	1.7376	110.0000	1194.6000	(29a)
Total net area of external elements Aum(A, m2)			83.9200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8269			(33)
Main dwelling								
Party Wall 1			24.3200	0.0000	0.0000	110.0000	2675.2000	(32)
Party Floor 1			55.1000			70.0000	3857.0000	(32d)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16670.3198 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		302.5466 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.4600	0.0380	1.5755
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	3.1800	0.0380	0.1208
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8785 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.7054 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	(39)

Average = Sum(39)m / 12 = 59.8888

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	(40)
HLP (average)												1.0869	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)
Hot water usage for baths	23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)
Hot water usage for other uses	33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)

Energy content (annual) Total = Sum(45)m = 1715.5200

Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)

Total per year (kWh/year) = Sum(64)m = 2032.8510 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	46.7521	0.3300	0.0000	0.7700	77.2180	(78)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
South	5.4500	46.7521	0.3300	0.0000	0.7700	64.7444	(78)

Solar gains	149.7606	248.3714	324.7600	381.6941	411.9394	402.9853	390.9424	368.7080	344.2235	270.1694	178.0861	129.0370	(83)
Total gains	572.2606	669.2008	732.2541	763.8920	769.4050	737.8905	712.3978	692.5968	680.7951	629.5284	565.1757	540.3864	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	
alpha	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	
util living area	0.9860	0.9651	0.9221	0.8366	0.6935	0.5150	0.3694	0.3969	0.5956	0.8556	0.9684	0.9898	(86)
MIT	20.2655	20.4636	20.6745	20.8558	20.9606	20.9944	20.9994	20.9990	20.9870	20.8581	20.5196	20.2060	(87)
Th 2	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	(88)
util rest of house	0.9811	0.9541	0.8993	0.7946	0.6306	0.4377	0.2867	0.3121	0.5155	0.8085	0.9563	0.9862	(89)
MIT 2	19.1910	19.4352	19.6858	19.8851	19.9843	20.0090	20.0114	20.0113	20.0049	19.8934	19.5082	19.1164	(90)
Living area fraction											fLA = Living area / (4) =	0.4368	(91)
MIT	19.6604	19.8845	20.1177	20.3091	20.4108	20.4395	20.4430	20.4428	20.4339	20.3148	19.9500	19.5924	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6604	19.8845	20.1177	20.3091	20.4108	20.4395	20.4430	20.4428	20.4339	20.3148	19.9500	19.5924	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9789	0.9524	0.9021	0.8080	0.6567	0.4714	0.3229	0.3492	0.5503	0.8242	0.9554	0.9842	(94)
Useful gains	560.2112	637.3324	660.5416	617.2514	505.2950	347.8543	230.0031	241.8726	374.6677	518.8277	539.9521	531.8448	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	919.9170	897.4014	815.5498	683.2781	521.6787	349.7209	230.1519	242.1170	379.3301	581.8075	769.5722	921.8295	(97)
Space heating kWh	267.6212	174.7664	115.3261	47.5392	12.1895	0.0000	0.0000	0.0000	0.0000	46.8570	165.3265	290.1486	(98a)
Space heating requirement - total per year (kWh/year)												1119.7744	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.6212	174.7664	115.3261	47.5392	12.1895	0.0000	0.0000	0.0000	0.0000	46.8570	165.3265	290.1486	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1119.7744	
Space heating per m2											(98c) / (4) =	20.3226	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	267.6212	174.7664	115.3261	47.5392	12.1895	0.0000	0.0000	0.0000	0.0000	46.8570	165.3265	290.1486	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	267.6212	174.7664	115.3261	47.5392	12.1895	0.0000	0.0000	0.0000	0.0000	46.8570	165.3265	290.1486	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1119.7744	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.6545	(230a)
Total electricity for the above, kWh/year	35.6545	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1914.7770	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1119.7744	16.4900	184.6508	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	16.4900	103.2963	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	35.6545	16.4900	5.8794	(249)
Energy for lighting	132.9302	16.4900	21.9202	(250)
Additional standing charges			0.0000	(251)
Total energy cost			315.7467	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1356	(257)
SAP value		81.5927	
SAP rating (Section 12)		82	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1119.7744	0.1574	176.2679	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			264.6748	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			288.8064	(272)
CO2 emissions per m2			5.2400	(273)
EI value			96.1339	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b) x	2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 55.1000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.8500	(17)

Infiltration rate	0.1925	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1636	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1759	0.1677	0.1677	0.1554	0.1595	0.1391	0.1391	0.1350	0.1391	0.1554	0.1514	0.1636	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	61.0300	14.6700	46.3600	0.2100	9.7356	110.0000	5099.5999	(29a)
Communal Wall	12.0300	2.1500	9.8800	0.2000	1.9760	110.0000	1086.8000	(29a)
Stairwell Wall	10.8600		10.8600	0.1600	1.7376	110.0000	1194.6000	(29a)
Total net area of external elements Aum(A, m2)			83.9200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8269			(33)
Main dwelling								
Party Wall 1			24.3200	0.0000	0.0000	110.0000	2675.2000	(32)
Party Floor 1			55.1000			70.0000	3857.0000	(32d)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	16670.3198	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	302.5466	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.4600	0.0380	1.5755
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	3.1800	0.0380	0.1208
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.8785	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	36.7054	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	(39)
Average = Sum(39)m / 12 =												59.8888	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	(40)
HLP (average)												1.0869	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8403	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day)	103.2837	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
										Total per year (kWh/year) = Sum(64)m =		2032.8510	(64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)													
	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains													
	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	54.2217	0.3300	0.0000	0.7700	89.5553	(78)
Northeast	2.7200	13.7804	0.3300	0.0000	0.7700	9.5244	(75)
South	5.4500	54.2217	0.3300	0.0000	0.7700	75.0887	(78)

Solar gains	174.1683	251.9864	327.2374	392.7209	416.1135	432.3154	414.5296	398.1281	370.3480	294.1000	203.9051	151.0338	(83)
Total gains	596.6683	672.8159	734.7314	774.9188	773.5792	767.2207	735.9850	722.0169	706.9196	653.4589	590.9947	562.3832	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	
alpha	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	
util living area													
	0.9782	0.9554	0.9004	0.7866	0.6134	0.4050	0.2685	0.2819	0.5044	0.7943	0.9487	0.9836	(86)
MIT	20.3790	20.5392	20.7424	20.9070	20.9821	20.9988	20.9999	20.9999	20.9953	20.9159	20.6329	20.3276	(87)
Th 2	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	(88)
util rest of house													
	0.9706	0.9411	0.8718	0.7363	0.5442	0.3285	0.1881	0.2000	0.4233	0.7353	0.9295	0.9777	(89)
MIT 2	19.3329	19.5275	19.7635	19.9358	20.0009	20.0111	20.0115	20.0115	20.0096	19.9483	19.6439	19.2695	(90)
Living area fraction									fLA = Living area / (4) =			0.4368	(91)
MIT	19.7899	19.9694	20.1911	20.3601	20.4295	20.4426	20.4433	20.4433	20.4402	20.3710	20.0760	19.7317	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7899	19.9694	20.1911	20.3601	20.4295	20.4426	20.4433	20.4433	20.4402	20.3710	20.0760	19.7317	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9404	0.8775	0.7549	0.5740	0.3619	0.2232	0.2358	0.4588	0.7580	0.9309	0.9756	(94)
Useful gains	577.9058	632.7293	644.7443	584.9740	444.0005	277.6955	164.2804	170.2631	324.3090	495.3100	550.1841	548.6650	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	879.7583	854.5786	766.0427	626.4410	450.9340	278.0389	164.2930	170.2810	325.8081	531.2725	723.2136	876.2769	(97)
Space heating kWh													
	224.5783	149.0828	90.2460	29.8563	5.1585	0.0000	0.0000	0.0000	0.0000	26.7561	124.5812	243.7432	(98a)
Space heating requirement - total per year (kWh/year)												894.0025	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	224.5783	149.0828	90.2460	29.8563	5.1585	0.0000	0.0000	0.0000	0.0000	26.7561	124.5812	243.7432	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.0025	
Space heating per m2											(98c) / (4) =	16.2251	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	224.5783	149.0828	90.2460	29.8563	5.1585	0.0000	0.0000	0.0000	0.0000	26.7561	124.5812	243.7432	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	224.5783	149.0828	90.2460	29.8563	5.1585	0.0000	0.0000	0.0000	0.0000	26.7561	124.5812	243.7432	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)

Efficiency of water heater 324.5200 (216)

(217)m 324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)

Fuel for water heating, kWh/month

63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting 16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 894.0025 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 626.4178 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 35.6545 (230a)
Total electricity for the above, kWh/year 35.6545 (231)
Electricity for lighting (calculated in Appendix L) 132.9302 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1689.0051 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	894.0025	27.6700	247.3705	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	27.6700	173.3298	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	35.6545	27.6700	9.8656	(249)
Energy for lighting	132.9302	27.6700	36.7818	(250)
Additional standing charges			0.0000	(251)
Total energy cost			467.3477	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	894.0025	0.1582	141.3983	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			229.8051	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			253.9368	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	894.0025	1.5855	1417.4228	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			2370.7441	(279)
Pumps, fans and electric keep-hot	35.6545	1.5128	53.9382	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			2628.5752	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 82
Current environmental impact rating: A 96

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 82
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£467	£467	£0
Space heating	£257	£257	£0
Water heating	£173	£173	£0
Lighting	£37	£37	£0
Total cost of fuels	£467	£467	£0
Total cost of uses	£467	£467	£0
Delivered energy	31 kWh/m²	31 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	48 kWh/m²	48 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000	(1b)	x 2.5500	(2b) =	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8500	(17)
Infiltration rate		0.1925	(18)
Number of sides sheltered		2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1636	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2086	0.2045	0.2004	0.1800	0.1759	0.1554	0.1554	0.1514	0.1636	0.1759	0.1841	0.1923	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	61.0300	14.6700	46.3600	0.2100	9.7356	110.0000	5099.5999	(29a)
Communal Wall	12.0300	2.1500	9.8800	0.2000	1.9760	110.0000	1086.8000	(29a)
Stairwell Wall	10.8600		10.8600	0.1600	1.7376	110.0000	1194.6000	(29a)
Total net area of external elements Aum(A, m2)			83.9200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8269			(33)
Main dwelling								
Party Wall 1			24.3200	0.0000	0.0000	110.0000	2675.2000	(32)
Party Floor 1			55.1000			70.0000	3857.0000	(32d)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16670.3198 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 302.5466 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.4600	0.0380	1.5755
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	3.1800	0.0380	0.1208
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8785 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.7054 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	(39)
Average = Sum(39)m / 12 =												59.8888	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	(40)
HLP (average)												1.0869	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8403 (42)
Hot water usage for mixer showers

55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)

Hot water usage for baths

23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)

Hot water usage for other uses

33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day) 103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	
Distribution loss (46)m = 0.15 x (45)m	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
										Total per year (kWh/year) = Sum(64)m =		2032.8510	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	46.7521	0.3300	0.0000	0.7700	77.2180	(78)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
South	5.4500	46.7521	0.3300	0.0000	0.7700	64.7444	(78)

Solar gains	149.7606	248.3714	324.7600	381.6941	411.9394	402.9853	390.9424	368.7080	344.2235	270.1694	178.0861	129.0370	(83)
Total gains	572.2606	669.2008	732.2541	763.8920	769.4050	737.8905	712.3978	692.5968	680.7951	629.5284	565.1757	540.3864	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	
alpha	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	
util living area	0.9860	0.9651	0.9221	0.8366	0.6935	0.5150	0.3694	0.3969	0.5956	0.8556	0.9684	0.9898	(86)
MIT	20.2655	20.4636	20.6745	20.8558	20.9606	20.9944	20.9994	20.9990	20.9870	20.8581	20.5196	20.2060	(87)
Th 2	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	(88)
util rest of house	0.9811	0.9541	0.8993	0.7946	0.6306	0.4377	0.2867	0.3121	0.5155	0.8085	0.9563	0.9862	(89)
MIT 2	19.1910	19.4352	19.6858	19.8851	19.9843	20.0090	20.0114	20.0113	20.0049	19.8934	19.5082	19.1164	(90)
Living area fraction									fLA = Living area / (4) =			0.4368	(91)
MIT	19.6604	19.8845	20.1177	20.3091	20.4108	20.4395	20.4430	20.4428	20.4339	20.3148	19.9500	19.5924	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6604	19.8845	20.1177	20.3091	20.4108	20.4395	20.4430	20.4428	20.4339	20.3148	19.9500	19.5924	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9789	0.9524	0.9021	0.8080	0.6567	0.4714	0.3229	0.3492	0.5503	0.8242	0.9554	0.9842	(94)
Useful gains	560.2112	637.3324	660.5416	617.2514	505.2950	347.8543	230.0031	241.8726	374.6677	518.8277	539.9521	531.8448	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	919.9170	897.4014	815.5498	683.2781	521.6787	349.7209	230.1519	242.1170	379.3301	581.8075	769.5722	921.8295	(97)
Space heating kWh	267.6212	174.7664	115.3261	47.5392	12.1895	0.0000	0.0000	0.0000	0.0000	46.8570	165.3265	290.1486	(98a)
Space heating requirement - total per year (kWh/year)												1119.7744	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.6212	174.7664	115.3261	47.5392	12.1895	0.0000	0.0000	0.0000	0.0000	46.8570	165.3265	290.1486	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1119.7744	
Space heating per m2										(98c) / (4) =		20.3226	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	267.6212	174.7664	115.3261	47.5392	12.1895	0.0000	0.0000	0.0000	0.0000	46.8570	165.3265	290.1486	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	267.6212	174.7664	115.3261	47.5392	12.1895	0.0000	0.0000	0.0000	0.0000	46.8570	165.3265	290.1486	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)

Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1119.7744	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	626.4178	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.6545	(230a)
Total electricity for the above, kWh/year	35.6545	(231)
Electricity for lighting (calculated in Appendix L)	132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1914.7770	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1119.7744	16.4900	184.6508	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	16.4900	103.2963	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	35.6545	16.4900	5.8794	(249)
Energy for lighting	132.9302	16.4900	21.9202	(250)
Additional standing charges			0.0000	(251)
Total energy cost			315.7467	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1356	(257)
SAP value		81.5927	
SAP rating (Section 12)		82	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1119.7744	0.1574	176.2679	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			264.6748	(265)
Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			288.8064	(272)
CO2 emissions per m2			5.2400	(273)
EI value			96.1339	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	55.1000 (1b)	x	2.5500 (2b)	=	140.5050	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 55.1000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.5050	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.8500	(17)
Infiltration rate		0.1925	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1636	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1759	0.1677	0.1677	0.1554	0.1595	0.1391	0.1391	0.1350	0.1391	0.1554	0.1514	0.1636	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	61.0300	14.6700	46.3600	0.2100	9.7356	110.0000	5099.5999	(29a)
Communal Wall	12.0300	2.1500	9.8800	0.2000	1.9760	110.0000	1086.8000	(29a)
Stairwell Wall	10.8600		10.8600	0.1600	1.7376	110.0000	1194.6000	(29a)
Total net area of external elements Aum(A, m2)			83.9200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8269			(33)
Main dwelling								
Party Wall 1			24.3200	0.0000	0.0000	110.0000	2675.2000	(32)
Party Floor 1			55.1000			70.0000	3857.0000	(32d)
Party Ceiling 1			55.1000			30.0000	1653.0000	(32b)
Internal Wall 1			122.6800			9.0000	1104.1200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16670.3198	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	302.5466	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	41.4600	0.0380	1.5755
E16 Corner (normal)	15.9000	0.0540	0.8586
E17 Corner (inverted - internal area greater than external area)	9.5400	-0.0970	-0.9254
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	3.1800	0.0380	0.1208
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E25 Staggered party wall between dwellings	3.1800	0.0310	0.0986

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.8785	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	36.7054	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	23.1833	(38)
Heat transfer coeff	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	59.8888	(39)

Average = Sum(39)m / 12 =	59.8888

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	1.0869	(40)
HLP (average)												1.0869	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8403 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	55.0751	54.2475	53.0414	50.7338	49.0308	47.1317	46.0522	47.2491	48.5612	50.6003	52.9575	54.8641	(42a)
Hot water usage for baths	23.8073	23.4538	22.9559	22.0378	21.3504	20.5881	20.1764	20.6708	21.2092	22.0248	22.9618	23.7269	(42b)
Hot water usage for other uses	33.4764	32.2591	31.0418	29.8244	28.6071	27.3898	27.3898	28.6071	29.8244	31.0418	32.2591	33.4764	(42c)

Average daily hot water use (litres/day)	103.2837 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.3589	109.9603	107.0390	102.5960	98.9883	95.1096	93.6184	96.5271	99.5948	103.6669	108.1783	112.0674	(44)
Energy conte	177.9490	156.5820	164.5149	140.4488	133.2573	116.9483	113.2233	119.5207	122.8104	140.6750	154.1199	175.4704	(45)
Energy content (annual)										Total = Sum(45)m =		1715.5200	

Distribution loss (46)m = 0.15 x (45)m

	26.6923	23.4873	24.6772	21.0673	19.9886	17.5423	16.9835	17.9281	18.4216	21.1012	23.1180	26.3206 (46)

Water storage loss (or HIU loss):

Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage												
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218 (64)
Total per year (kWh/year) = Sum(64)m =												2032.8510 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	59.1680	52.0635	54.7012	46.6992	44.3080	38.8853	37.6468	39.7406	40.8345	46.7744	51.2449	58.3439 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	110.4173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.8177	16.7137	13.5925	10.2904	7.6922	6.4941	7.0171	9.1210	12.2422	15.5443	18.1425	19.3407	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	239.4676	241.9525	235.6906	222.3597	205.5318	189.7160	179.1501	176.6651	182.9271	196.2580	213.0858	228.9017	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	47.8820	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	-73.6116	(71)
Water heating gains (Table 5)													
	79.5269	77.4755	73.5231	64.8600	59.5538	54.0074	50.6005	53.4148	56.7145	62.8689	71.1734	78.4192	(72)
Total internal gains													
	422.5000	420.8295	407.4940	382.1979	357.4656	334.9053	321.4554	323.8888	336.5716	359.3590	387.0896	411.3494	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	54.2217	0.3300	0.0000	0.7700	89.5553	(78)
Northeast	2.7200	13.7804	0.3300	0.0000	0.7700	9.5244	(75)
South	5.4500	54.2217	0.3300	0.0000	0.7700	75.0887	(78)

Solar gains	174.1683	251.9864	327.2374	392.7209	416.1135	432.3154	414.5296	398.1281	370.3480	294.1000	203.9051	151.0338	(83)
Total gains	596.6683	672.8159	734.7314	774.9188	773.5792	767.2207	735.9850	722.0169	706.9196	653.4589	590.9947	562.3832	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	77.3208	
alpha	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	6.1547	
util living area													
	0.9782	0.9554	0.9004	0.7866	0.6134	0.4050	0.2685	0.2819	0.5044	0.7943	0.9487	0.9836	(86)
MIT	20.3790	20.5392	20.7424	20.9070	20.9821	20.9988	20.9999	20.9999	20.9953	20.9159	20.6329	20.3276	(87)
Th 2	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	20.0115	(88)
util rest of house													
	0.9706	0.9411	0.8718	0.7363	0.5442	0.3285	0.1881	0.2000	0.4233	0.7353	0.9295	0.9777	(89)
MIT 2	19.3329	19.5275	19.7635	19.9358	20.0009	20.0111	20.0115	20.0115	20.0096	19.9483	19.6439	19.2695	(90)
Living area fraction									fLA = Living area / (4) =			0.4368	(91)
MIT	19.7899	19.9694	20.1911	20.3601	20.4295	20.4426	20.4433	20.4433	20.4402	20.3710	20.0760	19.7317	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7899	19.9694	20.1911	20.3601	20.4295	20.4426	20.4433	20.4433	20.4402	20.3710	20.0760	19.7317	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9404	0.8775	0.7549	0.5740	0.3619	0.2232	0.2358	0.4588	0.7580	0.9309	0.9756	(94)
Useful gains	577.9058	632.7293	644.7443	584.9740	444.0005	277.6955	164.2804	170.2631	324.3090	495.3100	550.1841	548.6650	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	879.7583	854.5786	766.0427	626.4410	450.9340	278.0389	164.2930	170.2810	325.8081	531.2725	723.2136	876.2769	(97)
Space heating kWh													
	224.5783	149.0828	90.2460	29.8563	5.1585	0.0000	0.0000	0.0000	0.0000	26.7561	124.5812	243.7432	(98a)
Space heating requirement - total per year (kWh/year)												894.0025	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	224.5783	149.0828	90.2460	29.8563	5.1585	0.0000	0.0000	0.0000	0.0000	26.7561	124.5812	243.7432	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.0025	

Space heating per m2 (98c) / (4) = 16.2251 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	224.5783	149.0828	90.2460	29.8563	5.1585	0.0000	0.0000	0.0000	0.0000	26.7561	124.5812	243.7432	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	224.5783	149.0828	90.2460	29.8563	5.1585	0.0000	0.0000	0.0000	0.0000	26.7561	124.5812	243.7432	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	204.9004	180.9252	191.4663	166.5308	160.2087	143.0303	140.1747	146.4721	148.8924	167.6264	180.2019	202.4218	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.1395	55.7516	58.9999	51.3160	49.3679	44.0744	43.1945	45.1350	45.8808	51.6536	55.5287	62.3758	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0282	2.7351	3.0282	2.9305	3.0282	2.9305	3.0282	3.0282	2.9305	3.0282	2.9305	3.0282	(231)
Lighting	16.4710	13.2136	11.8974	8.7166	6.7329	5.5009	6.1420	7.9836	10.3699	13.6059	15.3678	16.9288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												894.0025	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												626.4178	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)													
mechanical ventilation fans (SFP = 0.2080)												35.6545	(230a)
Total electricity for the above, kWh/year												35.6545	(231)
Electricity for lighting (calculated in Appendix L)												132.9302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1689.0051	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	894.0025	27.6700	247.3705	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	27.6700	173.3298	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	35.6545	27.6700	9.8656	(249)
Energy for lighting	132.9302	27.6700	36.7818	(250)
Additional standing charges			0.0000	(251)
Total energy cost			467.3477	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	894.0025	0.1582	141.3983	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	626.4178	0.1411	88.4068	(264)
Space and water heating			229.8051	(265)

Pumps, fans and electric keep-hot	35.6545	0.1387	4.9457	(267)
Energy for lighting	132.9302	0.1443	19.1859	(268)
Total CO2, kg/year			253.9368	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	894.0025	1.5855	1417.4228	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	626.4178	1.5219	953.3213	(278)
Space and water heating			2370.7441	(279)
Pumps, fans and electric keep-hot	35.6545	1.5128	53.9382	(281)
Energy for lighting	132.9302	1.5338	203.8928	(282)
Total Primary energy kWh/year			2628.5752	(286)

Summary for Input Data

Plot Reference	P-43	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-43
Plot Address	Flat 10, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	78 C	**DER**	5.49	**TER**	11.11
Environmental	95 A	**% DER < TER**			50.59
CO_2 Emissions (t/year)	0.41	**DFEE**	31.92	**TFEE**	31.29
Compliance Check	See BREL	**% DFEE < TFEE**			-2.01
% DPER < TPER	3.71	**DPER**	56.39	**TPER**	58.56

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	0.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	34.73 m	88.53 m²	2.55 m

8.0 Living Area	30.81	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	69.73	44.99	0.00	None	24.74	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	22.41	20.26	0.90	Stairwell Access Corridor 4	2.15	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	17.42	17.42	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	28.22	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	210.63

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	88.53

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	88.53

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.15	
Patio Door	Patio Door	Brickwork	South East	2.46	
South East	Window	Brickwork	South East	5.42	
East	Window	Brickwork	East	16.86	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	61.34	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	12.60	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	6.30	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	6.30	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	17.92	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	11.33	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	37.80	0.02	0.02	RCD	Yes
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.90	0.33	0.33	AbbeyCalculated	No

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa

Summary for Input Data

elmhurst energy

Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.97	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	10
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
Controls SAP Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day
34.0 Small-scale Hydro	None	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

Summary for Input Data

None

Full SAP Calculation Printout

Plot Reference	P-43	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-43
Plot Address	Flat 10, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	78 C	**DER**	5.49	**TER**	11.11
Environmental	95 A	**% DER < TER**			50.59
CO_2 Emissions (t/year)	0.41	**DFEE**	31.92	**TFEE**	31.29
Compliance Check	See BREL	**% DFEE < TFEE**			-2.01
% DPER < TPER	3.71	**DPER**	56.39	**TPER**	58.56

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		225.7515	(5)

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2. Ventilation rate

---

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	69.7300	24.7400	44.9900	0.2100	9.4479	110.0000	4948.9004	(29a)
Communal Wall	22.4100	2.1500	20.2600	0.2000	4.0520	110.0000	2228.6000	(29a)
Stairwell Wall	17.4200		17.4200	0.1600	2.7872	110.0000	1916.2000	(29a)
Total net area of external elements Aum(A, m2)			109.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.1953			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			210.6300			9.0000	1895.6700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22946.5703 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		259.1954 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4279 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.6233 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	(39)
Average = Sum(39)m / 12 =												89.8723	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	(40)
HLP (average)												1.0152	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)											Total = Sum(45)m =	2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
											Total per year (kWh/year) = Sum(64)m =	2432.3983	(64)
12Total per year (kWh/year)												2432	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2100	131.9825	119.2100	123.1837	119.2100	123.1837	119.2100	119.2100	123.1837	119.2100	123.1837	119.2100	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains	515.6824	528.3777	504.5516	484.6874	457.5630	439.0886	420.4867	421.5043	435.7267	452.4980	483.3190	503.8885	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421 (83)
Total gains	673.4964	818.4677	947.3248	1092.7755	1180.3625	1171.6370	1120.7570	1036.1294	936.9106	786.5029	676.4761	636.1307 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	
alpha	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	
util living area	0.9944	0.9830	0.9502	0.8493	0.6764	0.4866	0.3522	0.3978	0.6394	0.9141	0.9861	0.9959	(86)
MIT	19.9981	20.2257	20.5143	20.8079	20.9549	20.9940	20.9992	20.9984	20.9747	20.7400	20.2983	19.9437	(87)
Th 2	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	(88)
util rest of house	0.9926	0.9778	0.9357	0.8130	0.6189	0.4180	0.2782	0.3181	0.5624	0.8828	0.9809	0.9945	(89)
MIT 2	18.9124	19.1997	19.5554	19.8921	20.0371	20.0677	20.0705	20.0702	20.0558	19.8282	19.2940	18.8431	(90)
Living area fraction										fLA = Living area / (4) =		0.3480	(91)
MIT	19.2902	19.5567	19.8891	20.2108	20.3565	20.3900	20.3937	20.3933	20.3756	20.1455	19.6435	19.2261	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2902	19.5567	19.8891	20.2108	20.3565	20.3900	20.3937	20.3933	20.3756	20.1455	19.6435	19.2261	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9905	0.9741	0.9324	0.8189	0.6371	0.4418	0.3040	0.3458	0.5884	0.8857	0.9778	0.9929	(94)
Useful gains	667.0884	797.3097	883.3186	894.8887	752.0610	517.5829	340.6885	358.3426	551.3210	696.6095	661.4807	631.5913	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1347.2072	1317.2351	1203.3072	1016.5258	777.9805	520.3626	340.9484	358.8834	564.0004	857.8753	1127.3154	1350.4301	(97)
Space heating kWh	506.0084	349.3899	238.0716	87.5788	19.2841	0.0000	0.0000	0.0000	0.0000	119.9818	335.4010	534.8161	(98a)
Space heating requirement - total per year (kWh/year)												2190.5315	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	506.0084	349.3899	238.0716	87.5788	19.2841	0.0000	0.0000	0.0000	0.0000	119.9818	335.4010	534.8161	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2190.5315	
Space heating per m2											(98c) / (4) =	24.7434	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	506.0084	349.3899	238.0716	87.5788	19.2841	0.0000	0.0000	0.0000	0.0000	119.9818	335.4010	534.8161	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	506.0084	349.3899	238.0716	87.5788	19.2841	0.0000	0.0000	0.0000	0.0000	119.9818	335.4010	534.8161	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2190.5315	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												749.5372	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3193.1734	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2190.5315	0.1570	344.0140	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			449.8519	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			486.0609	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.4900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2190.5315	1.5814	3464.0229	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			4604.9215	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			4991.9370	(286)
Dwelling Primary energy Rate (DPER)			56.3900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	225.7515	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	3 * 10 = 30.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1329	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3829	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3255	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4150	0.4068	0.3987	0.3580	0.3499	0.3092	0.3092	0.3010	0.3255	0.3499	0.3661	0.3824	(22b)
Effective ac	0.5861	0.5828	0.5795	0.5641	0.5612	0.5478	0.5478	0.5453	0.5530	0.5612	0.5670	0.5731	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.9900	1.1450	22.8893			(27)
Brickwork	69.7300	19.9900	49.7400	0.1800	8.9532			(29a)
Communal Wall	22.4100	2.1500	20.2600	0.1800	3.6468			(29a)
Stairwell Wall	17.4200		17.4200	0.1800	3.1356			(29a)
Total net area of external elements Aum(A, m2)			109.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.7749			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 259.1954 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0700	4.2938
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670
E18 Party wall between dwellings	6.3000	0.0600	0.3780
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0500	1.8900
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.0200	0.0980

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.5682 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6629	43.4138	43.1697	42.0230	41.8085	40.8098	40.8098	40.6248	41.1945	41.8085	42.2425	42.6962	(38)
Heat transfer coeff	92.2311	91.9820	91.7379	90.5912	90.3767	89.3780	89.3780	89.1931	89.7627	90.3767	90.8107	91.2644	(39)

Average = Sum(39)m / 12 = 90.5902

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0418	1.0390	1.0362	1.0233	1.0209	1.0096	1.0096	1.0075	1.0139	1.0209	1.0258	1.0309	(40)
HLP (average)												1.0233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	265.9895	235.1357	249.4246	218.2505	210.8868	189.2764	186.1876	193.9523	196.5057	220.0343	235.1073	262.9338	(62)
WWHRS	-31.0401	-27.4522	-28.7463	-23.8031	-22.1836	-18.9827	-17.7932	-18.9213	-19.6402	-23.1537	-26.2303	-30.4653	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)
										Total per year (kWh/year) = Sum(64)m =		2375.2726	(64)
12Total per year (kWh/year)												2375	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	110.2246	97.8577	104.7168	93.6487	91.9030	84.0148	83.6905	86.2723	86.4186	94.9445	99.2536	109.2086	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.1892	131.9595	119.1892	123.1622	119.1892	123.1622	119.1892	119.1892	123.1622	119.1892	123.1622	119.1892	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	148.1514	145.6216	140.7484	130.0677	123.5255	116.6873	112.4872	115.9573	120.0258	127.6136	137.8523	146.7858	(72)

Total internal gains

	568.7636	581.4567	557.6328	537.7680	510.6442	489.1692	470.5679	471.5855	485.8073	505.5792	536.3995	556.9698 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	13.6200	19.6403	0.6300	0.7000	0.7700	81.7516	(76)
Southeast	6.3700	36.7938	0.6300	0.7000	0.7700	71.6286	(77)

Solar gains	153.3802	281.9334	430.3105	590.9571	702.4273	711.8981	680.5313	597.3060	487.0716	324.6097	187.7292	128.5277 (83)
Total gains	722.1438	863.3901	987.9434	1128.7250	1213.0715	1201.0673	1151.0992	1068.8915	972.8788	830.1889	724.1286	685.4974 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.1095	69.2967	69.4811	70.3605	70.5276	71.3156	71.3156	71.4635	71.0100	70.5276	70.1905	69.8415	
alpha	5.6073	5.6198	5.6321	5.6907	5.7018	5.7544	5.7544	5.7642	5.7340	5.7018	5.6794	5.6561	
util living area	0.9924	0.9793	0.9440	0.8378	0.6641	0.4727	0.3412	0.3829	0.6184	0.8982	0.9814	0.9941	(86)
MIT	20.0120	20.2374	20.5226	20.8189	20.9580	20.9949	20.9994	20.9988	20.9786	20.7661	20.3363	19.9762	(87)
Th 2	20.0486	20.0510	20.0532	20.0640	20.0660	20.0754	20.0754	20.0771	20.0717	20.0660	20.0619	20.0577	(88)
util rest of house	0.9899	0.9731	0.9281	0.8002	0.6067	0.4061	0.2697	0.3066	0.5427	0.8633	0.9746	0.9923	(89)
MIT 2	18.9131	19.1985	19.5502	19.8969	20.0350	20.0728	20.0752	20.0767	20.0593	19.8515	19.3343	18.8746	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.2955	19.5601	19.8886	20.2177	20.3562	20.3937	20.3968	20.3976	20.3792	20.1698	19.6830	19.2580	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2955	19.5601	19.8886	20.2177	20.3562	20.3937	20.3968	20.3976	20.3792	20.1698	19.6830	19.2580	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9690	0.9249	0.8068	0.6251	0.4292	0.2946	0.3332	0.5684	0.8676	0.9712	0.9901	(94)
Useful gains	712.9936	836.6404	913.7128	910.6536	758.2706	515.4954	339.1385	356.1341	553.0056	720.2981	703.2523	678.7090	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1383.0555	1348.4636	1228.2455	1025.2866	782.3203	517.8296	339.3507	356.5585	563.6417	864.8830	1142.6738	1374.2579	(97)
Space heating kWh	498.5260	343.9452	234.0123	82.5357	17.8930	0.0000	0.0000	0.0000	0.0000	107.5712	316.3835	517.4884	(98a)
Space heating requirement - total per year (kWh/year)												2118.3553	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	498.5260	343.9452	234.0123	82.5357	17.8930	0.0000	0.0000	0.0000	0.0000	107.5712	316.3835	517.4884	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2118.3553	
Space heating per m2										(98c) / (4) =		23.9281	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	498.5260	343.9452	234.0123	82.5357	17.8930	0.0000	0.0000	0.0000	0.0000	107.5712	316.3835	517.4884	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	540.1149	372.6383	253.5345	89.4212	19.3857	0.0000	0.0000	0.0000	0.0000	116.5452	342.7773	560.6591	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7038	85.1830	84.1916	82.2851	80.5067	79.8000	79.8000	79.8000	79.8000	82.7638	84.9883	85.8004	(217)
Fuel for water heating, kWh/month	274.1411	243.8087	262.1144	236.3095	234.3944	213.4006	211.0205	219.3371	221.6360	237.8825	245.7715	270.9409	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.7652	19.8675	17.8885	13.1059	10.1234	8.2709	9.2349	12.0038	15.5918	20.4573	23.1065	25.4535	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4691	-34.6369	-52.0885	-61.3552	-68.5894	-64.8930	-64.0827	-59.2821	-51.2531	-40.8103	-26.3403	-20.1124	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.9372	-19.1683	-38.7962	-59.3119	-79.4625	-80.2372	-79.3113	-66.6912	-48.2675	-27.7712	-12.0453	-7.0415	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2295.0762	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2870.7573	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	199.8690	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1093.9542	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4357.7482	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2295.0762	0.2100	481.9660	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2870.7573	0.2100	602.8590	(264)
Space and water heating			1084.8250	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.8690	0.1443	28.8473	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9130	0.1336	-75.7632	
PV Unit electricity exported	-527.0413	0.1254	-66.0771	
Total			-141.8403	(269)
Total CO2, kg/year			983.7612	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2295.0762	1.1300	2593.4361	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2870.7573	1.1300	3243.9557	(278)
Space and water heating			5837.3918	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.8690	1.5338	306.5658	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9130	1.4939	-846.8906	
PV Unit electricity exported	-527.0413	0.4602	-242.5351	
Total			-1089.4257	(283)
Total Primary energy kWh/year			5184.6326	(286)
Target Primary Energy Rate (TPER)			58.5600	(287)

Full SAP Calculation Printout

Plot Reference	P-43	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-43
Plot Address	Flat 10, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	78 C	**DER**	5.49	**TER**	11.11
Environmental	95 A	**% DER < TER**			50.59
CO_2 Emissions (t/year)	0.41	**DFEE**	31.92	**TFEE**	31.29
Compliance Check	See BREL	**% DFEE < TFEE**			-2.01
% DPER < TPER	3.71	**DPER**	56.39	**TPER**	58.56

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1329	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9700	(17)
Infiltration rate		0.2814	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2392	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3050	0.2990	0.2930	0.2631	0.2571	0.2272	0.2272	0.2212	0.2392	0.2571	0.2691	0.2810	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5465	0.5447	0.5429	0.5346	0.5331	0.5258	0.5258	0.5245	0.5286	0.5331	0.5362	0.5395	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	69.7300	24.7400	44.9900	0.2100	9.4479	110.0000	4948.9004	(29a)
Communal Wall	22.4100	2.1500	20.2600	0.2000	4.0520	110.0000	2228.6000	(29a)
Stairwell Wall	17.4200		17.4200	0.1600	2.7872	110.0000	1916.2000	(29a)
Total net area of external elements Aum(A, m2)			109.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.1953			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			210.6300			9.0000	1895.6700	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22946.5703	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							259.1954	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309	
E16 Corner (normal)	12.6000	0.0540	0.6804	
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111	
E18 Party wall between dwellings	6.3000	0.0380	0.2394	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665	
E4 Jamb	37.8000	0.0160	0.6048	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4279 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.6233 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.7131	40.5786	40.4467	39.8274	39.7115	39.1722	39.1722	39.0723	39.3799	39.7115	39.9459	40.1910	(38)
Heat transfer coeff	93.3363	93.2018	93.0700	92.4507	92.3348	91.7954	91.7954	91.6955	92.0032	92.3348	92.5692	92.8143	(39)
Average = Sum(39)m / 12 =												92.4501	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0543	1.0528	1.0513	1.0443	1.0430	1.0369	1.0369	1.0358	1.0392	1.0430	1.0456	1.0484	(40)
HLP (average)												1.0443	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 64.7389 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.6300	68.6924	66.5771	63.9443	61.5955	59.1546	58.6475	60.7586	62.9237	65.4304	68.0865	70.5309	(44)
Energy conte	111.8607	97.8171	102.3265	87.5365	82.9194	72.7375	70.9291	75.2318	77.5912	88.7884	97.0017	110.4343	(45)
Energy content (annual)										Total = Sum(45)m =		1075.1741	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(64)
										Total per year (kWh/year) = Sum(64)m =		913.8980	(64)
12Total per year (kWh/year)												914	(64)
Electric shower(s)	54.3750	48.4486	52.9040	50.4856	51.4330	49.0621	50.6975	51.4330	50.4856	52.9040	51.9092	54.3750	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		618.5126	(64a)
Heat gains from water heating, kWh/month	37.3642	32.8983	34.9704	31.2229	30.4786	27.7222	27.7468	28.8450	29.1095	32.0935	33.5902	37.0611	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2100	131.9825	119.2100	123.1837	119.2100	123.1837	119.2100	119.2100	123.1837	119.2100	123.1837	119.2100	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	50.2206	48.9558	47.0032	43.3652	40.9659	38.5031	37.2941	38.7702	40.4299	43.1365	46.6530	49.8132	(72)
Total internal gains	467.8537	481.8139	460.9085	448.0869	425.1054	411.0065	395.3956	394.4191	406.2329	418.1229	442.2217	457.0181	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	625.6677	771.9039	903.6817	1056.1750	1147.9049	1143.5549	1095.6659	1009.0442	907.4168	752.1278	635.3789	589.2602	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.2912	68.3897	68.4866	68.9454	69.0319	69.4375	69.4375	69.5132	69.2807	69.0319	68.8571	68.6753	
alpha	5.5527	5.5593	5.5658	5.5964	5.6021	5.6292	5.6292	5.6342	5.6187	5.6021	5.5905	5.5784	
util living area	0.9962	0.9878	0.9618	0.8717	0.7046	0.5078	0.3678	0.4162	0.6684	0.9311	0.9901	0.9973	(86)
MIT	19.8804	20.1163	20.4247	20.7626	20.9402	20.9918	20.9989	20.9978	20.9661	20.6882	20.2117	19.8358	(87)
Th 2	20.0383	20.0396	20.0408	20.0466	20.0477	20.0527	20.0527	20.0536	20.0508	20.0477	20.0455	20.0432	(88)
util rest of house	0.9950	0.9839	0.9499	0.8378	0.6459	0.4353	0.2891	0.3316	0.5888	0.9038	0.9863	0.9963	(89)
MIT 2	19.0252	19.2595	19.5596	19.8719	20.0125	20.0495	20.0525	20.0531	20.0350	19.8167	19.3601	18.9848	(90)
Living area fraction										fLA = Living area / (4) =		0.3480	(91)
MIT	19.3228	19.5577	19.8607	20.1819	20.3354	20.3774	20.3818	20.3819	20.3590	20.1200	19.6565	19.2809	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3228	19.5577	19.8607	20.1819	20.3354	20.3774	20.3818	20.3819	20.3590	20.1200	19.6565	19.2809	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9937	0.9814	0.9473	0.8430	0.6643	0.4605	0.3165	0.3611	0.6157	0.9062	0.9842	0.9953	(94)
Useful gains	621.7242	757.5122	856.0340	890.3900	762.5937	526.5558	346.7872	364.3616	558.6557	681.5973	625.3494	586.5156	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1402.1760	1366.1223	1243.4797	1043.0172	797.3439	530.3412	347.1548	365.1210	575.8483	879.0285	1162.3430	1399.7259	(97)
Space heating kWh	580.6561	408.9860	288.2596	109.8916	25.8542	0.0000	0.0000	0.0000	0.0000	146.8889	386.6354	605.0284	(98a)
Space heating requirement - total per year (kWh/year)												2552.2001	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	580.6561	408.9860	288.2596	109.8916	25.8542	0.0000	0.0000	0.0000	0.0000	146.8889	386.6354	605.0284	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2552.2001	
Space heating per m2										(98c) / (4) =		28.8286	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	862.8770	679.2861	696.8861	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9630	0.9842	0.9745	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	830.9480	668.5689	679.1152	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1289.9639	1236.3028	1137.3929	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	330.4914	422.3940	340.9586	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	82.6229	105.5985	85.2396	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												273.4610	(107)
Energy for space heating												28.8286	(99)
Energy for space cooling												3.0889	(108)
Total												31.9176	(109)
Fabric Energy Efficiency (DFEE)												31.9	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		225.7515	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1329 (8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3829	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3255	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4150	0.4068	0.3987	0.3580	0.3499	0.3092	0.3092	0.3010	0.3255	0.3499	0.3661	0.3824	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5731	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.9900	1.1450	22.8893			(27)
Brickwork	69.7300	19.9900	49.7400	0.1800	8.9532			(29a)
Communal Wall	22.4100	2.1500	20.2600	0.1800	3.6468			(29a)
Stairwell Wall	17.4200		17.4200	0.1800	3.1356			(29a)
Total net area of external elements Aum(A, m2)			109.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.7749			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	259.1954	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0700	4.2938
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670
E18 Party wall between dwellings	6.3000	0.0600	0.3780
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0500	1.8900
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.0200	0.0980

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.7933	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	48.5682	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6629	43.4138	43.1697	42.0230	41.8085	40.8098	40.8098	40.6248	41.1945	41.8085	42.2425	42.6962	(38)
Heat transfer coeff	92.2311	91.9820	91.7379	90.5912	90.3767	89.3780	89.3780	89.1931	89.7627	90.3767	90.8107	91.2644	(39)
Average = Sum(39)m / 12 =												90.5902	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0418	1.0390	1.0362	1.0233	1.0209	1.0096	1.0096	1.0075	1.0139	1.0209	1.0258	1.0309	(40)
HLP (average)												1.0233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6051	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day)	64.7389	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.6300	68.6924	66.5771	63.9443	61.5955	59.1546	58.6475	60.7586	62.9237	65.4304	68.0865	70.5309	(44)
Energy conte	111.8607	97.8171	102.3265	87.5365	82.9194	72.7375	70.9291	75.2318	77.5912	88.7884	97.0017	110.4343	(45)
Energy content (annual)										Total = Sum(45)m =		1075.1741	

Distribution loss (46)m = 0.15 x (45)m

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(64)

Total per year (kWh/year) = Sum(64)m =	913.8980	(64)
12Total per year (kWh/year)	914	(64)

Electric shower(s)

54.3750	48.4486	52.9040	50.4856	51.4330	49.0621	50.6975	51.4330	50.4856	52.9040	51.9092	54.3750	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	618.5126	(64a)

Heat gains from water heating, kWh/month

37.3642	32.8983	34.9704	31.2229	30.4786	27.7222	27.7468	28.8450	29.1095	32.0935	33.5902	37.0611	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	119.1892	131.9595	119.1892	123.1622	119.1892	123.1622	119.1892	119.1892	123.1622	119.1892	123.1622	119.1892	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)													
	50.2206	48.9558	47.0032	43.3652	40.9659	38.5031	37.2941	38.7702	40.4299	43.1365	46.6530	49.8132	(72)
Total internal gains													
	467.8329	481.7909	460.8877	448.0654	425.0846	410.9850	395.3748	394.3983	406.2114	418.1021	442.2002	456.9972	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	13.6200	19.6403	0.6300	0.7000	0.7700	81.7516	(76)
Southeast	6.3700	36.7938	0.6300	0.7000	0.7700	71.6286	(77)

Solar gains	153.3802	281.9334	430.3105	590.9571	702.4273	711.8981	680.5313	597.3060	487.0716	324.6097	187.7292	128.5277	(83)
Total gains	621.2131	763.7243	891.1982	1039.0225	1127.5119	1122.8831	1075.9061	991.7043	893.2829	742.7118	629.9294	585.5249	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.1095	69.2967	69.4811	70.3605	70.5276	71.3156	71.3156	71.4635	71.0100	70.5276	70.1905	69.8415	
alpha	5.6073	5.6198	5.6321	5.6907	5.7018	5.7544	5.7544	5.7642	5.7340	5.7018	5.6794	5.6561	
util living area													
	0.9963	0.9881	0.9628	0.8723	0.7041	0.5042	0.3648	0.4122	0.6649	0.9310	0.9902	0.9973	(86)
MIT	19.8948	20.1283	20.4330	20.7716	20.9439	20.9929	20.9991	20.9982	20.9694	20.7008	20.2318	19.8590	(87)
Th 2	20.0486	20.0510	20.0532	20.0640	20.0660	20.0754	20.0754	20.0771	20.0717	20.0660	20.0619	20.0577	(88)
util rest of house													
	0.9951	0.9843	0.9512	0.8388	0.6463	0.4337	0.2885	0.3303	0.5868	0.9038	0.9864	0.9964	(89)
MIT 2	19.0477	19.2806	19.5782	19.8957	20.0330	20.0725	20.0751	20.0766	20.0575	19.8442	19.3934	19.0194	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.3425	19.5756	19.8757	20.2005	20.3500	20.3929	20.3967	20.3974	20.3748	20.1423	19.6852	19.3116	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3425	19.5756	19.8757	20.2005	20.3500	20.3929	20.3967	20.3974	20.3748	20.1423	19.6852	19.3116	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9939	0.9819	0.9487	0.8442	0.6645	0.4582	0.3151	0.3589	0.6132	0.9064	0.9845	0.9955	(94)
Useful gains	617.4040	749.8994	845.4367	877.1011	749.2608	514.4939	339.0371	355.9089	547.7669	673.2024	620.1506	582.8669	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1387.3877	1349.8927	1227.0572	1023.7279	781.7595	517.7544	339.3409	356.5371	563.2444	862.4003	1142.8683	1379.1499	(97)
Space heating kWh													
	572.8679	403.1955	283.9256	105.5713	24.1791	0.0000	0.0000	0.0000	0.0000	140.7633	376.3568	592.4346	(98a)
Space heating requirement - total per year (kWh/year)												2499.2940	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	572.8679	403.1955	283.9256	105.5713	24.1791	0.0000	0.0000	0.0000	0.0000	140.7633	376.3568	592.4346	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2499.2940	
Space heating per m2										(98c) / (4) =		28.2310	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	840.1532	661.3972	677.8672	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9661	0.9859	0.9771	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	811.6537	652.0768	662.3723	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1265.8255	1213.2292	1117.1472	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	327.0037	417.4974	338.3525	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	81.7509	104.3744	84.5881	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												270.7134	(107)
Energy for space heating												28.2310	(99)
Energy for space cooling												3.0579	(108)
Total												31.2889	(109)
Fabric Energy Efficiency (TFEE)												31.3	(109)

Full SAP Calculation Printout

Plot Reference	P-43	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-43
Plot Address	Flat 10, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	78 C	**DER**	5.49	**TER**	11.11
Environmental	95 A	**% DER < TER**			50.59
CO_2 Emissions (t/year)	0.41	**DFEE**	31.92	**TFEE**	31.29
Compliance Check	See BREL	**% DFEE < TFEE**			-2.01
% DPER < TPER	3.71	**DPER**	56.39	**TPER**	58.56

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		225.7515	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	69.7300	24.7400	44.9900	0.2100	9.4479	110.0000	4948.9004	(29a)
Communal Wall	22.4100	2.1500	20.2600	0.2000	4.0520	110.0000	2228.6000	(29a)
Stairwell Wall	17.4200		17.4200	0.1600	2.7872	110.0000	1916.2000	(29a)
Total net area of external elements Aum(A, m2)			109.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.1953			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			210.6300			9.0000	1895.6700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22946.5703 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		259.1954 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4279 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.6233 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	(39)
Average = Sum(39)m / 12 =												89.8723	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	(40)
HLP (average)												1.0152	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)											Total = Sum(45)m =	2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
											Total per year (kWh/year) = Sum(64)m =	2432.3983	(64)
12Total per year (kWh/year)												2432	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2100	131.9825	119.2100	123.1837	119.2100	123.1837	119.2100	119.2100	123.1837	119.2100	123.1837	119.2100	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains	515.6824	528.3777	504.5516	484.6874	457.5630	439.0886	420.4867	421.5043	435.7267	452.4980	483.3190	503.8885	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421 (83)
Total gains	673.4964	818.4677	947.3248	1092.7755	1180.3625	1171.6370	1120.7570	1036.1294	936.9106	786.5029	676.4761	636.1307 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	
alpha	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	
util living area	0.9944	0.9830	0.9502	0.8493	0.6764	0.4866	0.3522	0.3978	0.6394	0.9141	0.9861	0.9959	(86)
MIT	19.9981	20.2257	20.5143	20.8079	20.9549	20.9940	20.9992	20.9984	20.9747	20.7400	20.2983	19.9437	(87)
Th 2	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	(88)
util rest of house	0.9926	0.9778	0.9357	0.8130	0.6189	0.4180	0.2782	0.3181	0.5624	0.8828	0.9809	0.9945	(89)
MIT 2	18.9124	19.1997	19.5554	19.8921	20.0371	20.0677	20.0705	20.0702	20.0558	19.8282	19.2940	18.8431	(90)
Living area fraction										fLA = Living area / (4) =		0.3480	(91)
MIT	19.2902	19.5567	19.8891	20.2108	20.3565	20.3900	20.3937	20.3933	20.3756	20.1455	19.6435	19.2261	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2902	19.5567	19.8891	20.2108	20.3565	20.3900	20.3937	20.3933	20.3756	20.1455	19.6435	19.2261	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9905	0.9741	0.9324	0.8189	0.6371	0.4418	0.3040	0.3458	0.5884	0.8857	0.9778	0.9929	(94)
Useful gains	667.0884	797.3097	883.3186	894.8887	752.0610	517.5829	340.6885	358.3426	551.3210	696.6095	661.4807	631.5913	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1347.2072	1317.2351	1203.3072	1016.5258	777.9805	520.3626	340.9484	358.8834	564.0004	857.8753	1127.3154	1350.4301	(97)
Space heating kWh	506.0084	349.3899	238.0716	87.5788	19.2841	0.0000	0.0000	0.0000	0.0000	119.9818	335.4010	534.8161	(98a)
Space heating requirement - total per year (kWh/year)												2190.5315	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	506.0084	349.3899	238.0716	87.5788	19.2841	0.0000	0.0000	0.0000	0.0000	119.9818	335.4010	534.8161	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2190.5315	
Space heating per m2											(98c) / (4) =	24.7434	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	506.0084	349.3899	238.0716	87.5788	19.2841	0.0000	0.0000	0.0000	0.0000	119.9818	335.4010	534.8161	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	506.0084	349.3899	238.0716	87.5788	19.2841	0.0000	0.0000	0.0000	0.0000	119.9818	335.4010	534.8161	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2190.5315	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												749.5372	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3193.1734	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2190.5315	0.1570	344.0140	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			449.8519	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			486.0609	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.4900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2190.5315	1.5814	3464.0229	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			4604.9215	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			4991.9370	(286)
Dwelling Primary energy Rate (DPER)			56.3900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	225.7515	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	3 * 10 = 30.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1329	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3829	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3255	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4150	0.4068	0.3987	0.3580	0.3499	0.3092	0.3092	0.3010	0.3255	0.3499	0.3661	0.3824	(22b)
Effective ac	0.5861	0.5828	0.5795	0.5641	0.5612	0.5478	0.5478	0.5453	0.5530	0.5612	0.5670	0.5731	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.9900	1.1450	22.8893			(27)
Brickwork	69.7300	19.9900	49.7400	0.1800	8.9532			(29a)
Communal Wall	22.4100	2.1500	20.2600	0.1800	3.6468			(29a)
Stairwell Wall	17.4200		17.4200	0.1800	3.1356			(29a)
Total net area of external elements Aum(A, m2)			109.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.7749			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 259.1954 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0700	4.2938
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670
E18 Party wall between dwellings	6.3000	0.0600	0.3780
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0500	1.8900
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.0200	0.0980

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.5682 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6629	43.4138	43.1697	42.0230	41.8085	40.8098	40.8098	40.6248	41.1945	41.8085	42.2425	42.6962	(38)
Heat transfer coeff	92.2311	91.9820	91.7379	90.5912	90.3767	89.3780	89.3780	89.1931	89.7627	90.3767	90.8107	91.2644	(39)

Average = Sum(39)m / 12 = 90.5902

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0418	1.0390	1.0362	1.0233	1.0209	1.0096	1.0096	1.0075	1.0139	1.0209	1.0258	1.0309	(40)
HLP (average)												1.0233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	265.9895	235.1357	249.4246	218.2505	210.8868	189.2764	186.1876	193.9523	196.5057	220.0343	235.1073	262.9338	(62)
WWHRS	-31.0401	-27.4522	-28.7463	-23.8031	-22.1836	-18.9827	-17.7932	-18.9213	-19.6402	-23.1537	-26.2303	-30.4653	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)
										Total per year (kWh/year) = Sum(64)m =		2375.2726	(64)
12Total per year (kWh/year)												2375	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	110.2246	97.8577	104.7168	93.6487	91.9030	84.0148	83.6905	86.2723	86.4186	94.9445	99.2536	109.2086	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.1892	131.9595	119.1892	123.1622	119.1892	123.1622	119.1892	119.1892	123.1622	119.1892	123.1622	119.1892	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	148.1514	145.6216	140.7484	130.0677	123.5255	116.6873	112.4872	115.9573	120.0258	127.6136	137.8523	146.7858	(72)

Total internal gains

	568.7636	581.4567	557.6328	537.7680	510.6442	489.1692	470.5679	471.5855	485.8073	505.5792	536.3995	556.9698 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	13.6200	19.6403	0.6300	0.7000	0.7700	81.7516	(76)
Southeast	6.3700	36.7938	0.6300	0.7000	0.7700	71.6286	(77)

Solar gains	153.3802	281.9334	430.3105	590.9571	702.4273	711.8981	680.5313	597.3060	487.0716	324.6097	187.7292	128.5277 (83)
Total gains	722.1438	863.3901	987.9434	1128.7250	1213.0715	1201.0673	1151.0992	1068.8915	972.8788	830.1889	724.1286	685.4974 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.1095	69.2967	69.4811	70.3605	70.5276	71.3156	71.3156	71.4635	71.0100	70.5276	70.1905	69.8415	
alpha	5.6073	5.6198	5.6321	5.6907	5.7018	5.7544	5.7544	5.7642	5.7340	5.7018	5.6794	5.6561	
util living area	0.9924	0.9793	0.9440	0.8378	0.6641	0.4727	0.3412	0.3829	0.6184	0.8982	0.9814	0.9941	(86)
MIT	20.0120	20.2374	20.5226	20.8189	20.9580	20.9949	20.9994	20.9988	20.9786	20.7661	20.3363	19.9762	(87)
Th 2	20.0486	20.0510	20.0532	20.0640	20.0660	20.0754	20.0754	20.0771	20.0717	20.0660	20.0619	20.0577	(88)
util rest of house	0.9899	0.9731	0.9281	0.8002	0.6067	0.4061	0.2697	0.3066	0.5427	0.8633	0.9746	0.9923	(89)
MIT 2	18.9131	19.1985	19.5502	19.8969	20.0350	20.0728	20.0752	20.0767	20.0593	19.8515	19.3343	18.8746	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.2955	19.5601	19.8886	20.2177	20.3562	20.3937	20.3968	20.3976	20.3792	20.1698	19.6830	19.2580	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2955	19.5601	19.8886	20.2177	20.3562	20.3937	20.3968	20.3976	20.3792	20.1698	19.6830	19.2580	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9690	0.9249	0.8068	0.6251	0.4292	0.2946	0.3332	0.5684	0.8676	0.9712	0.9901	(94)
Useful gains	712.9936	836.6404	913.7128	910.6536	758.2706	515.4954	339.1385	356.1341	553.0056	720.2981	703.2523	678.7090	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1383.0555	1348.4636	1228.2455	1025.2866	782.3203	517.8296	339.3507	356.5585	563.6417	864.8830	1142.6738	1374.2579	(97)
Space heating kWh	498.5260	343.9452	234.0123	82.5357	17.8930	0.0000	0.0000	0.0000	0.0000	107.5712	316.3835	517.4884	(98a)
Space heating requirement - total per year (kWh/year)												2118.3553	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	498.5260	343.9452	234.0123	82.5357	17.8930	0.0000	0.0000	0.0000	0.0000	107.5712	316.3835	517.4884	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2118.3553	
Space heating per m2										(98c) / (4) =		23.9281	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	498.5260	343.9452	234.0123	82.5357	17.8930	0.0000	0.0000	0.0000	0.0000	107.5712	316.3835	517.4884	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	540.1149	372.6383	253.5345	89.4212	19.3857	0.0000	0.0000	0.0000	0.0000	116.5452	342.7773	560.6591	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7038	85.1830	84.1916	82.2851	80.5067	79.8000	79.8000	79.8000	79.8000	82.7638	84.9883	85.8004	(217)
Fuel for water heating, kWh/month	274.1411	243.8087	262.1144	236.3095	234.3944	213.4006	211.0205	219.3371	221.6360	237.8825	245.7715	270.9409	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.7652	19.8675	17.8885	13.1059	10.1234	8.2709	9.2349	12.0038	15.5918	20.4573	23.1065	25.4535	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4691	-34.6369	-52.0885	-61.3552	-68.5894	-64.8930	-64.0827	-59.2821	-51.2531	-40.8103	-26.3403	-20.1124	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.9372	-19.1683	-38.7962	-59.3119	-79.4625	-80.2372	-79.3113	-66.6912	-48.2675	-27.7712	-12.0453	-7.0415	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2295.0762	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2870.7573	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	199.8690	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1093.9542	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4357.7482	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2295.0762	0.2100	481.9660	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2870.7573	0.2100	602.8590	(264)
Space and water heating			1084.8250	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.8690	0.1443	28.8473	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9130	0.1336	-75.7632	
PV Unit electricity exported	-527.0413	0.1254	-66.0771	
Total			-141.8403	(269)
Total CO2, kg/year			983.7612	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2295.0762	1.1300	2593.4361	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2870.7573	1.1300	3243.9557	(278)
Space and water heating			5837.3918	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.8690	1.5338	306.5658	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9130	1.4939	-846.8906	
PV Unit electricity exported	-527.0413	0.4602	-242.5351	
Total			-1089.4257	(283)
Total Primary energy kWh/year			5184.6326	(286)
Target Primary Energy Rate (TPER)			58.5600	(287)

Full SAP Calculation Printout

Plot Reference	P-43	Issued on Date	24/04/2026
Assessment Reference	As Built	Plot Type Ref	P-43
Plot Address	Flat 10, 3 Carters Close, READING, RG1 8GR	SAP Version	10.2

SAP Rating	78 C	DER	5.49	TER	11.11
Environmental	95 A	% DER < TER			50.59
CO_2 Emissions (t/year)	0.41	DFEE	31.92	TFEE	31.29
Compliance Check	See BREL	% DFEE < TFEE			-2.01
% DPER < TPER	3.71	DPER	56.39	TPER	58.56

Assessor Details	Mr. Matthew Fitzpatrick	Assessor ID	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	69.7300	24.7400	44.9900	0.2100	9.4479	110.0000	4948.9004	(29a)
Communal Wall	22.4100	2.1500	20.2600	0.2000	4.0520	110.0000	2228.6000	(29a)
Stairwell Wall	17.4200		17.4200	0.1600	2.7872	110.0000	1916.2000	(29a)
Total net area of external elements Aum(A, m2)			109.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.1953			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			210.6300			9.0000	1895.6700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22946.5703 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		259.1954 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309	
E16 Corner (normal)	12.6000	0.0540	0.6804	
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111	
E18 Party wall between dwellings	6.3000	0.0380	0.2394	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665	
E4 Jamb	37.8000	0.0160	0.6048	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4279 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.6233 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	(39)
Average = Sum(39)m / 12 =												89.8723	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	(40)
HLP (average)												1.0152	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
										Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains	583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)

Total gains	741.6769	871.9844	1005.9722	1136.1045	1215.6574	1193.5049	1142.2328	1059.4965	963.9459	828.8565	726.8638	699.9454	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	
alpha	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	
util living area													
	0.9910	0.9774	0.9372	0.8321	0.6602	0.4781	0.3457	0.3891	0.6240	0.8974	0.9807	0.9934	(86)
MIT	20.0768	20.2832	20.5657	20.8287	20.9600	20.9945	20.9993	20.9986	20.9775	20.7699	20.3534	20.0182	(87)
Th 2	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	(88)
util rest of house													
	0.9882	0.9707	0.9200	0.7941	0.6031	0.4104	0.2730	0.3111	0.5479	0.8624	0.9737	0.9913	(89)
MIT 2	19.0120	19.2711	19.6157	19.9132	20.0412	20.0679	20.0705	20.0703	20.0576	19.8599	19.3624	18.9377	(90)
Living area fraction										fLA = Living area / (4) =		0.3480	(91)
MIT	19.3826	19.6233	19.9463	20.2318	20.3609	20.3904	20.3937	20.3934	20.3778	20.1766	19.7073	19.3137	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3826	19.6233	19.9463	20.2318	20.3609	20.3904	20.3937	20.3934	20.3778	20.1766	19.7073	19.3137	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9854	0.9667	0.9173	0.8011	0.6214	0.4339	0.2983	0.3383	0.5737	0.8669	0.9703	0.9890	(94)
Useful gains	730.8728	842.9543	922.7996	910.1589	755.4566	517.8582	340.7169	358.4103	553.0123	718.5516	705.2847	692.2500	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1355.5079	1323.2159	1208.4504	1018.4189	778.3769	520.3948	340.9520	358.8918	564.1975	860.6693	1133.0471	1358.3064	(97)
Space heating kWh													
	464.7285	322.7358	212.5242	77.9472	17.0527	0.0000	0.0000	0.0000	0.0000	105.7355	307.9890	495.5459	(98a)
Space heating requirement - total per year (kWh/year)												2004.2588	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	464.7285	322.7358	212.5242	77.9472	17.0527	0.0000	0.0000	0.0000	0.0000	105.7355	307.9890	495.5459	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2004.2588	
Space heating per m2											(98c) / (4) =	22.6393	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	464.7285	322.7358	212.5242	77.9472	17.0527	0.0000	0.0000	0.0000	0.0000	105.7355	307.9890	495.5459	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	464.7285	322.7358	212.5242	77.9472	17.0527	0.0000	0.0000	0.0000	0.0000	105.7355	307.9890	495.5459	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2004.2588	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												749.5372	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3006.9007	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2004.2588	16.4900	330.5023	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	16.4900	123.5987	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	16.4900	9.4466	(249)
Energy for lighting	195.8180	16.4900	32.2904	(250)
Additional standing charges			0.0000	(251)
Total energy cost			495.8379	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3368	(257)
SAP value		78.3306	
SAP rating (Section 12)		78	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2004.2588	0.1571	314.9624	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			420.8003	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			457.0092	(272)
CO2 emissions per m2			5.1600	(273)
EI value			95.4138	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		88.5300 (1b)	x	2.5500 (2b)	=	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	225.7515	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9700	(17)
Infiltration rate		0.1485	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1357	0.1294	0.1294	0.1199	0.1231	0.1073	0.1073	0.1041	0.1073	0.1199	0.1168	0.1262	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	69.7300	24.7400	44.9900	0.2100	9.4479	110.0000	4948.9004	(29a)
Communal Wall	22.4100	2.1500	20.2600	0.2000	4.0520	110.0000	2228.6000	(29a)
Stairwell Wall	17.4200		17.4200	0.1600	2.7872	110.0000	1916.2000	(29a)
Total net area of external elements Aum(A, m2)			109.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.1953			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			210.6300			9.0000	1895.6700	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22946.5703 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 259.1954 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4279 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.6233 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	(39)

Average = Sum(39)m / 12 = 89.8723

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	(40)
HLP (average)												1.0152	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)
Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
									Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024 (71)

Water heating gains (Table 5)

	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837 (72)

Total internal gains

	583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	43.0593	0.3300	0.0000	0.7700	26.9158	(77)
East	16.8600	23.8018	0.3300	0.0000	0.7700	101.9698	(76)
Southeast	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(77)

Solar gains	188.1877	302.5209	458.9184	640.7489	742.9149	796.9067	754.0877	677.9214	554.0398	374.0043	226.9565	158.5693	(83)
Total gains	772.0507	884.4153	1022.1173	1168.7653	1235.7728	1257.8633	1196.0501	1122.7928	1016.8018	868.8559	760.6631	726.2725	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	
alpha	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	
util living area	0.9863	0.9700	0.9160	0.7765	0.5771	0.3707	0.2479	0.2720	0.5236	0.8438	0.9684	0.9897	(86)
MIT	20.1954	20.3766	20.6552	20.8915	20.9821	20.9988	20.9999	20.9998	20.9918	20.8546	20.4796	20.1439	(87)
Th 2	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	(88)
util rest of house	0.9819	0.9609	0.8932	0.7305	0.5154	0.3049	0.1781	0.1978	0.4457	0.7957	0.9569	0.9863	(89)
MIT 2	19.1622	19.3875	19.7215	19.9775	20.0591	20.0703	20.0707	20.0707	20.0668	19.9486	19.5187	19.0976	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.5217	19.7317	20.0465	20.2956	20.3803	20.3934	20.3941	20.3941	20.3887	20.2639	19.8531	19.4618	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5217	19.7317	20.0465	20.2956	20.3803	20.3934	20.3941	20.3941	20.3887	20.2639	19.8531	19.4618	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9569	0.8926	0.7422	0.5363	0.3278	0.2024	0.2236	0.4727	0.8066	0.9537	0.9834	(94)
Useful gains	755.4906	846.2990	912.3194	867.5017	662.7400	412.3499	242.1029	251.0713	480.6483	700.8049	725.4106	714.2353	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1296.1134	1261.0647	1136.5681	934.2768	672.2743	412.8192	242.1234	251.1079	484.2954	787.6313	1065.2625	1290.7243	(97)
Space heating kWh	402.2234	278.7225	166.8411	48.0781	7.0935	0.0000	0.0000	0.0000	0.0000	64.5989	244.6934	428.9078	(98a)
Space heating requirement - total per year (kWh/year)												1641.1586	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	402.2234	278.7225	166.8411	48.0781	7.0935	0.0000	0.0000	0.0000	0.0000	64.5989	244.6934	428.9078	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1641.1586	
Space heating per m2											(98c) / (4) =	18.5379	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	402.2234	278.7225	166.8411	48.0781	7.0935	0.0000	0.0000	0.0000	0.0000	64.5989	244.6934	428.9078	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	402.2234	278.7225	166.8411	48.0781	7.0935	0.0000	0.0000	0.0000	0.0000	64.5989	244.6934	428.9078	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1641.1586	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	749.5372	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2643.8006	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1641.1586	27.6700	454.1086	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	27.6700	207.3970	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	27.6700	15.8512	(249)
Energy for lighting	195.8180	27.6700	54.1828	(250)
Additional standing charges			0.0000	(251)
Total energy cost			731.5396	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1641.1586	0.1579	259.1423	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			364.9802	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			401.1891	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1641.1586	1.5845	2600.4383	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			3741.3368	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			4128.3523	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 78
Current environmental impact rating: A 95

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 78
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£732	£732	£0
Space heating	£470	£470	£0
Water heating	£207	£207	£0
Lighting	£54	£54	£0
Total cost of fuels	£732	£732	£0
Total cost of uses	£731	£731	£0
Delivered energy	30 kWh/m²	30 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	47 kWh/m²	47 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		225.7515	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.9700 (17)
Infiltration rate		0.1485 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1609	0.1578	0.1546	0.1388	0.1357	0.1199	0.1199	0.1168	0.1262	0.1357	0.1420	0.1483	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	69.7300	24.7400	44.9900	0.2100	9.4479	110.0000	4948.9004	(29a)
Communal Wall	22.4100	2.1500	20.2600	0.2000	4.0520	110.0000	2228.6000	(29a)
Stairwell Wall	17.4200		17.4200	0.1600	2.7872	110.0000	1916.2000	(29a)
Total net area of external elements Aum(A, m2)			109.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.1953			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			210.6300			9.0000	1895.6700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22946.5703 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		259.1954 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.4279 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.6233 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	(39)
Average = Sum(39)m / 12 =												89.8723	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	(40)
HLP (average)												1.0152	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6051 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day)		127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
										Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)

Water heating gains (Table 5)

	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837 (72)

Total internal gains

	583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	741.6769	871.9844	1005.9722	1136.1045	1215.6574	1193.5049	1142.2328	1059.4965	963.9459	828.8565	726.8638	699.9454	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	
alpha	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	
util living area	0.9910	0.9774	0.9372	0.8321	0.6602	0.4781	0.3457	0.3891	0.6240	0.8974	0.9807	0.9934	(86)
MIT	20.0768	20.2832	20.5657	20.8287	20.9600	20.9945	20.9993	20.9986	20.9775	20.7699	20.3534	20.0182	(87)
Th 2	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	(88)
util rest of house	0.9882	0.9707	0.9200	0.7941	0.6031	0.4104	0.2730	0.3111	0.5479	0.8624	0.9737	0.9913	(89)
MIT 2	19.0120	19.2711	19.6157	19.9132	20.0412	20.0679	20.0705	20.0703	20.0576	19.8599	19.3624	18.9377	(90)
Living area fraction									fLA = Living area / (4) =			0.3480	(91)
MIT	19.3826	19.6233	19.9463	20.2318	20.3609	20.3904	20.3937	20.3934	20.3778	20.1766	19.7073	19.3137	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3826	19.6233	19.9463	20.2318	20.3609	20.3904	20.3937	20.3934	20.3778	20.1766	19.7073	19.3137	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9854	0.9667	0.9173	0.8011	0.6214	0.4339	0.2983	0.3383	0.5737	0.8669	0.9703	0.9890	(94)
Useful gains	730.8728	842.9543	922.7996	910.1589	755.4566	517.8582	340.7169	358.4103	553.0123	718.5516	705.2847	692.2500	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1355.5079	1323.2159	1208.4504	1018.4189	778.3769	520.3948	340.9520	358.8918	564.1975	860.6693	1133.0471	1358.3064	(97)
Space heating kWh	464.7285	322.7358	212.5242	77.9472	17.0527	0.0000	0.0000	0.0000	0.0000	105.7355	307.9890	495.5459	(98a)
Space heating requirement - total per year (kWh/year)												2004.2588	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	464.7285	322.7358	212.5242	77.9472	17.0527	0.0000	0.0000	0.0000	0.0000	105.7355	307.9890	495.5459	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2004.2588	
Space heating per m2											(98c) / (4) =	22.6393	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	464.7285	322.7358	212.5242	77.9472	17.0527	0.0000	0.0000	0.0000	0.0000	105.7355	307.9890	495.5459	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	464.7285	322.7358	212.5242	77.9472	17.0527	0.0000	0.0000	0.0000	0.0000	105.7355	307.9890	495.5459	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2004.2588	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	749.5372	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3006.9007	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2004.2588	16.4900	330.5023	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	16.4900	123.5987	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	16.4900	9.4466	(249)
Energy for lighting	195.8180	16.4900	32.2904	(250)
Additional standing charges			0.0000	(251)
Total energy cost			495.8379	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3368	(257)
SAP value		78.3306	
SAP rating (Section 12)		78	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2004.2588	0.1571	314.9624	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			420.8003	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			457.0092	(272)
CO2 emissions per m2			5.1600	(273)
EI value			95.4138	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		225.7515	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9700	(17)
Infiltration rate		0.1485	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1262	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate													
	0.1357	0.1294	0.1294	0.1199	0.1231	0.1073	0.1073	0.1041	0.1073	0.1199	0.1168	0.1262	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	69.7300	24.7400	44.9900	0.2100	9.4479	110.0000	4948.9004	(29a)
Communal Wall	22.4100	2.1500	20.2600	0.2000	4.0520	110.0000	2228.6000	(29a)
Stairwell Wall	17.4200		17.4200	0.1600	2.7872	110.0000	1916.2000	(29a)
Total net area of external elements Aum(A, m2)			109.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.1953			(33)
Main dwelling								
Party Wall 1			28.2200	0.0000	0.0000	110.0000	3104.1999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Party Ceiling 1			88.5300			30.0000	2655.9000	(32b)
Internal Wall 1			210.6300			9.0000	1895.6700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	22946.5703 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		259.1954 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	61.3400	0.0380	2.3309
E16 Corner (normal)	12.6000	0.0540	0.6804
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111
E18 Party wall between dwellings	6.3000	0.0380	0.2394
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.9200	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.4279 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	52.6233 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff													
	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	89.8723	(39)
Average = Sum(39)m / 12 =												89.8723	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	1.0152	(40)
HLP (average)												1.0152	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6051 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)
Hot water usage for baths													
	29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)
Hot water usage for other uses													
	41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)
Average daily hot water use (litres/day)												127.3386	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m													
	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)
Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
246.3460 217.3932 229.7811 199.2407 191.2433 170.2665 166.5441 174.3088 177.4959 200.3908 216.0975 243.2903 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
Output from w/h
246.3460 217.3932 229.7811 199.2407 191.2433 170.2665 166.5441 174.3088 177.4959 200.3908 216.0975 243.2903 (64)
Total per year (kWh/year) = Sum(64)m = 2432.3983 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
72.9487 64.1891 67.4409 57.5753 54.6271 47.9413 46.4146 48.9963 50.3451 57.6686 63.1802 71.9327 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
27.7201 24.6207 20.0229 15.1586 11.3313 9.5663 10.3367 13.4361 18.0339 22.8982 26.7256 28.4905 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
352.7570 356.4175 347.1931 327.5555 302.7666 279.4684 263.9039 260.2433 269.4677 289.1053 313.8943 337.1924 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
53.2354 53.2354 53.2354 53.2354 53.2354 53.2354 53.2354 53.2354 53.2354 53.2354 53.2354 53.2354 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-104.2024 -104.2024 -104.2024 -104.2024 -104.2024 -104.2024 -104.2024 -104.2024 -104.2024 -104.2024 -104.2024 -104.2024 (71)
Water heating gains (Table 5)
98.0493 95.5195 90.6463 79.9657 73.4235 66.5852 62.3852 65.8553 69.9238 77.5115 87.7502 96.6837 (72)
Total internal gains
583.8630 581.8944 563.1990 528.0164 492.8579 460.9566 441.9624 444.8714 462.7620 494.8517 533.7067 567.7032 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	43.0593	0.3300	0.0000	0.7700	26.9158	(77)
East	16.8600	23.8018	0.3300	0.0000	0.7700	101.9698	(76)
Southeast	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(77)

Solar gains	188.1877	302.5209	458.9184	640.7489	742.9149	796.9067	754.0877	677.9214	554.0398	374.0043	226.9565	158.5693	(83)
Total gains	772.0507	884.4153	1022.1173	1168.7653	1235.7728	1257.8633	1196.0501	1122.7928	1016.8018	868.8559	760.6631	726.2725	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	70.9234	
alpha	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	5.7282	
util living area	0.9863	0.9700	0.9160	0.7765	0.5771	0.3707	0.2479	0.2720	0.5236	0.8438	0.9684	0.9897	(86)
MIT	20.1954	20.3766	20.6552	20.8915	20.9821	20.9988	20.9999	20.9998	20.9918	20.8546	20.4796	20.1439	(87)
Th 2	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	20.0707	(88)
util rest of house	0.9819	0.9609	0.8932	0.7305	0.5154	0.3049	0.1781	0.1978	0.4457	0.7957	0.9569	0.9863	(89)
MIT 2	19.1622	19.3875	19.7215	19.9775	20.0591	20.0703	20.0707	20.0707	20.0668	19.9486	19.5187	19.0976	(90)
Living area fraction										fLA = Living area / (4) =		0.3480	(91)
MIT	19.5217	19.7317	20.0465	20.2956	20.3803	20.3934	20.3941	20.3941	20.3887	20.2639	19.8531	19.4618	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5217	19.7317	20.0465	20.2956	20.3803	20.3934	20.3941	20.3941	20.3887	20.2639	19.8531	19.4618	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9569	0.8926	0.7422	0.5363	0.3278	0.2024	0.2236	0.4727	0.8066	0.9537	0.9834	(94)
Useful gains	755.4906	846.2990	912.3194	867.5017	662.7400	412.3499	242.1029	251.0713	480.6483	700.8049	725.4106	714.2353	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1296.1134	1261.0647	1136.5681	934.2768	672.2743	412.8192	242.1234	251.1079	484.2954	787.6313	1065.2625	1290.7243	(97)
Space heating kWh	402.2234	278.7225	166.8411	48.0781	7.0935	0.0000	0.0000	0.0000	0.0000	64.5989	244.6934	428.9078	(98a)
Space heating requirement - total per year (kWh/year)												1641.1586	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	402.2234	278.7225	166.8411	48.0781	7.0935	0.0000	0.0000	0.0000	0.0000	64.5989	244.6934	428.9078	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1641.1586	
Space heating per m2											(98c) / (4) =	18.5379	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	402.2234	278.7225	166.8411	48.0781	7.0935	0.0000	0.0000	0.0000	0.0000	64.5989	244.6934	428.9078	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	402.2234	278.7225	166.8411	48.0781	7.0935	0.0000	0.0000	0.0000	0.0000	64.5989	244.6934	428.9078	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1641.1586	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												749.5372	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)													
mechanical ventilation fans (SFP = 0.2080)												57.2867	(230a)
Total electricity for the above, kWh/year												57.2867	(231)
Electricity for lighting (calculated in Appendix L)												195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2643.8006	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1641.1586	27.6700	454.1086	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	27.6700	207.3970	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	27.6700	15.8512	(249)
Energy for lighting	195.8180	27.6700	54.1828	(250)
Additional standing charges			0.0000	(251)
Total energy cost			731.5396	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1641.1586	0.1579	259.1423	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			364.9802	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			401.1891	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1641.1586	1.5845	2600.4383	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			3741.3368	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			4128.3523	(286)

Summary for Input Data

Plot Reference	P-44	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-44
Plot Address	Flat 11, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.37	**TER**	11.61
Environmental	96 A	**% DER < TER**			53.75
CO_2 Emissions (t/year)	0.3	**DFEE**	30.67	**TFEE**	27.90
Compliance Check	See BREL	**% DFEE < TFEE**			-9.95
% DPER < TPER	9.99	**DPER**	55.30	**TPER**	61.43

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	269.75	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	22.17 m	68.26 m²	2.55 m

8.0 Living Area	24.42	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	62.87	42.21	0.00	None	20.66	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.96	4.84	0.90	Stairwell Access Corridor 4	2.12	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	43.76	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	177.59

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	68.26

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)

Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted		70.00	68.26

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.12	
Patio Door	Patio Door	Brickwork	West	5.42	
SE	Window	Brickwork	South East	5.45	
West	Window	Brickwork	West	9.79	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	39.44	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	6.30	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	3.15	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	9.45	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	27.68	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	9.63	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	33.00	0.02	0.02	RCD	Yes
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.90	0.33	0.33	AbbeyCalculated	No

Y-value	0.06	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes	
Approved Installation	Yes	
Mechanical Ventilation data Type	Database	
Type	Mechanical extract ventilation - centralised	
MV Reference Number	500107	
Configuration	2	
Manufacturer SFP	0.16	
Duct Type	Rigid	
Wet Rooms	2	

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa

Summary for Input Data

Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.95	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	10
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	

25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	

26.0 Heat Networks	None	

27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

Summary for Input Data

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-44	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-44
Plot Address	Flat 11, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.37	**TER**	11.61
Environmental	96 A	**% DER < TER**			53.75
CO_2 Emissions (t/year)	0.3	**DFEE**	30.67	**TFEE**	27.90
Compliance Check	See BREL	**% DFEE < TFEE**			-9.95
% DPER < TPER	9.99	**DPER**	55.30	**TPER**	61.43

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.0630	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.9500 (17)
Infiltration rate		0.1975 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1679 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2140	0.2098	0.2056	0.1847	0.1805	0.1595	0.1595	0.1553	0.1679	0.1805	0.1889	0.1973	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1200	1.2000	2.5440			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	62.8700	20.6600	42.2100	0.2100	8.8641	110.0000	4643.0999	(29a)
Communal Wall	6.9600	2.1200	4.8400	0.2000	0.9680	110.0000	532.4000	(29a)
Total net area of external elements Aum(A, m2)			69.8300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.0326			(33)
Main dwelling								
Party Wall 1			43.7600	0.0000	0.0000	110.0000	4813.5998	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			177.5900			9.0000	1598.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18413.4097 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		269.7540 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	39.4400	0.0380	1.4987	
E16 Corner (normal)	6.3000	0.0540	0.3402	
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055	
E18 Party wall between dwellings	9.4500	0.0380	0.3591	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815	
E4 Jamb	33.0000	0.0160	0.5280	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.5190	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	40.5516	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	(39)
Average = Sum(39)m / 12 =												69.2720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	(40)
HLP (average)												1.0148	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.2032	(42)
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)
Average daily hot water use (litres/day)												114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
										Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
12Total per year (kWh/year)												2222	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4484	107.8893	97.4484	100.6967	97.4484	100.6967	97.4484	97.4484	100.6967	97.4484	100.6967	97.4484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains	435.0134	445.1807	425.2984	408.1709	385.4533	369.7820	354.2259	355.3466	367.3114	381.6530	407.7002	425.2587	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	126.8606	235.2831	363.2959	503.7918	601.8990	611.0565	583.7249	510.4736	412.9979	272.1207	155.6778	106.0279	(83)

Total gains	561.8740	680.4638	788.5944	911.9627	987.3523	980.8385	937.9508	865.8202	780.3093	653.7737	563.3780	531.2866	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	
alpha	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	
util living area													
	0.9928	0.9784	0.9369	0.8171	0.6334	0.4497	0.3247	0.3674	0.5991	0.8936	0.9822	0.9947	(86)
MIT	20.0936	20.3198	20.5981	20.8592	20.9715	20.9967	20.9996	20.9992	20.9841	20.7939	20.3803	20.0387	(87)
Th 2	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	(88)
util rest of house													
	0.9904	0.9717	0.9191	0.7770	0.5767	0.3855	0.2563	0.2936	0.5242	0.8570	0.9755	0.9930	(89)
MIT 2	19.0303	19.3143	19.6530	19.9443	20.0506	20.0694	20.0709	20.0708	20.0621	19.8851	19.3935	18.9607	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.4107	19.6741	19.9911	20.2716	20.3801	20.4011	20.4031	20.4029	20.3919	20.2102	19.7465	19.3463	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4107	19.6741	19.9911	20.2716	20.3801	20.4011	20.4031	20.4029	20.3919	20.2102	19.7465	19.3463	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9682	0.9174	0.7862	0.5959	0.4085	0.2808	0.3200	0.5506	0.8632	0.9726	0.9911	(94)
Useful gains	555.2511	658.8480	723.4324	716.9826	588.4060	400.6494	263.3479	277.0663	429.6311	564.3183	547.9329	526.5838	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1046.7473	1023.4275	934.5552	787.7355	601.2847	401.8542	263.4506	277.2885	435.8548	665.7168	876.0499	1049.2163	(97)
Space heating kWh													
	365.6732	244.9974	157.0754	50.9421	9.5817	0.0000	0.0000	0.0000	0.0000	75.4405	236.2442	388.8386	(98a)
Space heating requirement - total per year (kWh/year)												1528.7931	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	365.6732	244.9974	157.0754	50.9421	9.5817	0.0000	0.0000	0.0000	0.0000	75.4405	236.2442	388.8386	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1528.7931	
Space heating per m2											(98c) / (4) =	22.3966	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	365.6732	244.9974	157.0754	50.9421	9.5817	0.0000	0.0000	0.0000	0.0000	75.4405	236.2442	388.8386	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	365.6732	244.9974	157.0754	50.9421	9.5817	0.0000	0.0000	0.0000	0.0000	75.4405	236.2442	388.8386	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1528.7931	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												684.8345	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2417.8695	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1528.7931	0.1574	240.6998	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			337.3772	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			366.6074	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.3700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1528.7931	1.5828	2419.8010	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			3462.1223	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			3774.4665	(286)
Dwelling Primary energy Rate (DPER)			55.3000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b) x	2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1149	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3649	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3102	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3644	(22b)
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1200	1.0000	2.1200			(26)
TER Opening Type			14.9400	1.1450	17.1069			(27)
Brickwork	62.8700	14.9400	47.9300	0.1800	8.6274			(29a)
Communal Wall	6.9600	2.1200	4.8400	0.1800	0.8712			(29a)
Total net area of external elements Aum(A, m2)			69.8300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.7255			(33)
Main dwelling								
Party Wall 1			43.7600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 269.7540 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.4400	0.0700	2.7608
E16 Corner (normal)	6.3000	0.0900	0.5670
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0900	-0.2835
E18 Party wall between dwellings	9.4500	0.0600	0.5670
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0500	1.6500
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.0200	0.0980

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8408 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 34.5663 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.2120	33.0376	32.8666	32.0636	31.9134	31.2140	31.2140	31.0845	31.4834	31.9134	32.2173	32.5350	(38)
Heat transfer coeff	67.7782	67.6038	67.4329	66.6299	66.4796	65.7803	65.7803	65.6507	66.0496	66.4796	66.7836	67.1013	(39)

Average = Sum(39)m / 12 = 66.6292

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9929	0.9904	0.9879	0.9761	0.9739	0.9637	0.9637	0.9618	0.9676	0.9739	0.9784	0.9830	(40)
HLP (average)												0.9761	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	244.2086	215.9707	229.2891	201.0606	194.5772	174.9630	172.3298	179.3233	181.4738	202.8156	216.2432	241.4563	(62)
WWHRS	-27.9594	-24.7276	-25.8933	-21.4407	-19.9819	-17.0987	-16.0273	-17.0434	-17.6909	-20.8557	-23.6270	-27.4417	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
										Total per year (kWh/year) = Sum(64)m =		2193.9237	(64)
12Total per year (kWh/year)												2194	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.9825	91.4853	98.0217	87.9331	86.4800	79.2556	79.0828	81.4081	81.4205	89.2193	92.9813	102.0673	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4991	107.9455	97.4991	100.7491	97.4991	100.7491	97.4991	97.4991	100.7491	97.4991	100.7491	97.4991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	138.4173	136.1389	131.7496	122.1293	116.2366	110.0773	106.2940	109.4195	113.0840	119.9184	129.1407	137.1873	(72)
Total internal gains	488.1661	498.3389	478.4512	461.3254	438.6060	419.9364	404.3786	405.4993	417.4658	434.8057	460.8546	478.4115	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.9400	36.7938	0.6300	0.7000	0.7700	44.3040	(77)
West	11.0000	19.6403	0.6300	0.7000	0.7700	66.0255	(80)

Solar gains	110.3295	204.6260	315.9640	438.1612	523.4912	531.4570	507.6853	443.9740	359.1927	236.6653	135.3921	92.2112 (83)
Total gains	598.4957	702.9649	794.4152	899.4865	962.0973	951.3935	912.0640	849.4733	776.6585	671.4710	596.2467	570.6226 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.4643	75.6590	75.8508	76.7649	76.9384	77.7564	77.7564	77.9098	77.4393	76.9384	76.5882	76.2256	
alpha	6.0310	6.0439	6.0567	6.1177	6.1292	6.1838	6.1838	6.1940	6.1626	6.1292	6.1059	6.0817	
util living area	0.9898	0.9736	0.9307	0.8084	0.6267	0.4409	0.3172	0.3551	0.5775	0.8720	0.9750	0.9921	(86)
MIT	20.1805	20.3860	20.6375	20.8795	20.9766	20.9977	20.9998	20.9995	20.9890	20.8386	20.4716	20.1461	(87)
Th 2	20.0892	20.0914	20.0934	20.1033	20.1051	20.1137	20.1137	20.1153	20.1104	20.1051	20.1014	20.0975	(88)
util rest of house	0.9865	0.9657	0.9118	0.7685	0.5719	0.3806	0.2534	0.2870	0.5071	0.8323	0.9661	0.9895	(89)
MIT 2	19.1541	19.4125	19.7184	19.9953	20.0884	20.1126	20.1136	20.1152	20.1043	19.9623	19.5303	19.1171	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.5213	19.7608	20.0472	20.3116	20.4061	20.4292	20.4307	20.4315	20.4208	20.2758	19.8670	19.4852	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5213	19.7608	20.0472	20.3116	20.4061	20.4292	20.4307	20.4315	20.4208	20.2758	19.8670	19.4852	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9839	0.9623	0.9108	0.7783	0.5907	0.4022	0.2762	0.3114	0.5321	0.8406	0.9632	0.9873	(94)
Useful gains	588.8679	676.4316	723.5211	700.0475	568.2652	382.6166	251.9171	264.5403	413.2253	564.4471	574.3326	563.3524	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1031.6743	1004.6442	913.5256	760.3564	578.7814	383.4480	251.9812	264.6733	417.4859	643.2450	852.6280	1025.6584	(97)
Space heating kWh	329.4479	220.5589	141.3634	43.4224	7.8241	0.0000	0.0000	0.0000	0.0000	58.6257	200.3727	343.9557	(98a)
Space heating requirement - total per year (kWh/year)												1345.5707	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	329.4479	220.5589	141.3634	43.4224	7.8241	0.0000	0.0000	0.0000	0.0000	58.6257	200.3727	343.9557	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1345.5707	
Space heating per m2											(98c) / (4) =	19.7124	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	329.4479	220.5589	141.3634	43.4224	7.8241	0.0000	0.0000	0.0000	0.0000	58.6257	200.3727	343.9557	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	356.9317	238.9587	153.1565	47.0448	8.4768	0.0000	0.0000	0.0000	0.0000	63.5165	217.0885	372.6497	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0010	84.3804	83.2601	81.4063	80.1484	79.8000	79.8000	79.8000	79.8000	81.8207	84.1484	85.1179	(217)
Fuel for water heating, kWh/month	254.4077	226.6440	244.2897	220.6463	217.8400	197.8249	195.8678	203.3583	205.2416	222.3885	228.9005	251.4330	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.2584	16.2520	14.6332	10.7209	8.2811	6.7657	7.5543	9.8194	12.7544	16.7345	18.9015	20.8214	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3097	-27.1387	-40.9913	-48.5121	-54.4469	-51.6086	-50.9825	-47.0687	-40.5401	-32.0904	-20.5959	-15.6793	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.6768	-14.3471	-29.0842	-44.5267	-59.7068	-60.2923	-59.5797	-50.0615	-36.1941	-20.7886	-9.0009	-5.2574	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1457.8231	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2668.8425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	163.4968	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-843.4804	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3532.6820	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1457.8231	0.2100	306.1428	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2668.8425	0.2100	560.4569	(264)
Space and water heating			866.5998	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.4968	0.1443	23.5976	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9643	0.1335	-59.8223	
PV Unit electricity exported	-395.5161	0.1253	-49.5742	
Total			-109.3964	(269)
Total CO2, kg/year			792.7302	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1457.8231	1.1300	1647.3401	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2668.8425	1.1300	3015.7920	(278)
Space and water heating			4663.1321	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.4968	1.5338	250.7769	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9643	1.4935	-669.0306	
PV Unit electricity exported	-395.5161	0.4601	-181.9609	
Total			-850.9914	(283)
Total Primary energy kWh/year			4193.0183	(286)
Target Primary Energy Rate (TPER)			61.4300	(287)

Full SAP Calculation Printout

Plot Reference	P-44	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-44
Plot Address	Flat 11, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.37	**TER**	11.61
Environmental	96 A	**% DER < TER**			53.75
CO_2 Emissions (t/year)	0.3	**DFEE**	30.67	**TFEE**	27.90
Compliance Check	See BREL	**% DFEE < TFEE**			-9.95
% DPER < TPER	9.99	**DPER**	55.30	**TPER**	61.43

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1149	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.9500	(17)
Infiltration rate		0.3124	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2655	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3386	0.3319	0.3253	0.2921	0.2855	0.2523	0.2523	0.2456	0.2655	0.2855	0.2987	0.3120	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5573	0.5551	0.5529	0.5427	0.5407	0.5318	0.5318	0.5302	0.5353	0.5407	0.5446	0.5487	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1200	1.2000	2.5440			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	62.8700	20.6600	42.2100	0.2100	8.8641	110.0000	4643.0999	(29a)
Communal Wall	6.9600	2.1200	4.8400	0.2000	0.9680	110.0000	532.4000	(29a)
Total net area of external elements Aum(A, m2)			69.8300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0326			(33)
Main dwelling								
Party Wall 1			43.7600	0.0000	0.0000	110.0000	4813.5998	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			177.5900			9.0000	1598.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18413.4097 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		269.7540 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	39.4400	0.0380	1.4987

E16 Corner (normal)	6.3000	0.0540	0.3402	
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055	
E18 Party wall between dwellings	9.4500	0.0380	0.3591	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815	
E4 Jamb	33.0000	0.0160	0.5280	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.5190 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.5516 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.0125	31.8847	31.7594	31.1708	31.0607	30.5481	30.5481	30.4531	30.7455	31.0607	31.2835	31.5163	(38)
Heat transfer coeff	72.5641	72.4362	72.3109	71.7224	71.6122	71.0996	71.0996	71.0047	71.2971	71.6122	71.8350	72.0679	(39)
Average = Sum(39)m / 12 =												71.7218	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0631	1.0612	1.0593	1.0507	1.0491	1.0416	1.0416	1.0402	1.0445	1.0491	1.0524	1.0558	(40)
HLP (average)												1.0507	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 58.3103 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.6162	61.8713	59.9662	57.5948	55.4794	53.2809	52.8240	54.7252	56.6751	58.9328	61.3252	63.5268	(44)
Energy conte	100.7525	88.1039	92.1658	78.8444	74.6859	65.5151	63.8860	67.7612	69.8861	79.9713	87.3690	99.4677	(45)
Energy content (annual)										Total = Sum(45)m =		968.4090	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(64)
								Total per year (kWh/year) = Sum(64)m =			823.1476	(64)
12Total per year (kWh/year)											823	(64)

Electric shower(s)

48.9784	43.6401	47.6533	45.4750	46.3283	44.1927	45.6658	46.3283	45.4750	47.6533	46.7573	48.9784	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							557.1259	(64a)

Heat gains from water heating, kWh/month

33.6545	29.6321	31.4986	28.1232	27.4528	24.9701	24.9922	25.9813	26.2195	28.9072	30.2552	33.3815	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4484	107.8893	97.4484	100.6967	97.4484	100.6967	97.4484	97.4484	100.6967	97.4484	100.6967	97.4484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	45.2345	44.0954	42.3368	39.0600	36.8990	34.6808	33.5917	34.9211	36.4160	38.8538	42.0212	44.8676	(72)
Total internal gains	391.9326	403.2392	385.9876	375.2037	356.2177	344.4875	331.6256	330.9502	340.7455	350.6904	370.6827	383.0411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	126.8606	235.2831	363.2959	503.7918	601.8990	611.0565	583.7249	510.4736	412.9979	272.1207	155.6778	106.0279	(83)
Total gains	518.7933	638.5223	749.2836	878.9955	958.1167	955.5440	915.3505	841.4238	753.7434	622.8111	526.3606	489.0690	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.4872	70.6116	70.7339	71.3144	71.4240	71.9390	71.9390	72.0352	71.7398	71.4240	71.2026	70.9725	
alpha	5.6991	5.7074	5.7156	5.7543	5.7616	5.7959	5.7959	5.8023	5.7827	5.7616	5.7468	5.7315	
util living area													
	0.9954	0.9852	0.9533	0.8465	0.6666	0.4728	0.3413	0.3872	0.6323	0.9167	0.9879	0.9967	(86)
MIT	19.9566	20.1938	20.4982	20.8138	20.9589	20.9951	20.9994	20.9988	20.9769	20.7385	20.2807	19.9134	(87)
Th 2	20.0311	20.0327	20.0342	20.0413	20.0426	20.0488	20.0488	20.0500	20.0464	20.0426	20.0399	20.0371	(88)
util rest of house													
	0.9939	0.9804	0.9389	0.8085	0.6074	0.4041	0.2678	0.3078	0.5535	0.8848	0.9831	0.9955	(89)
MIT 2	19.0920	19.3270	19.6210	19.9083	20.0194	20.0470	20.0487	20.0497	20.0362	19.8543	19.4205	19.0539	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.4013	19.6371	19.9348	20.2323	20.3555	20.3862	20.3888	20.3892	20.3727	20.1707	19.7282	19.3614	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4013	19.6371	19.9348	20.2323	20.3555	20.3862	20.3888	20.3892	20.3727	20.1707	19.7282	19.3614	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9925	0.9779	0.9372	0.8166	0.6273	0.4287	0.2941	0.3362	0.5812	0.8896	0.9811	0.9945	(94)
Useful gains	514.9153	624.4149	702.2143	717.8073	601.0533	409.6156	269.2233	282.9130	438.0730	554.0799	516.4306	486.3610	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1095.8115	1067.4974	971.4853	812.7762	619.8408	411.3933	269.3819	283.2523	447.2276	685.3768	907.1481	1092.6470	(97)
Space heating kWh													
	432.1868	297.7514	200.3376	68.3776	13.9778	0.0000	0.0000	0.0000	0.0000	97.6849	281.3166	451.0768	(98a)
Space heating requirement - total per year (kWh/year)												1842.7096	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	432.1868	297.7514	200.3376	68.3776	13.9778	0.0000	0.0000	0.0000	0.0000	97.6849	281.3166	451.0768	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1842.7096	
Space heating per m2											(98c) / (4) =	26.9955	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	668.3366	526.1373	539.6358	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9755	0.9902	0.9835	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	651.9535	520.9675	530.7215	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1080.3660	1035.2944	950.7755	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	308.4571	382.6592	312.5201	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	77.1143	95.6648	78.1300	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												250.9091	(107)
Energy for space heating												26.9955	(99)
Energy for space cooling												3.6758	(108)
Total												30.6712	(109)
Fabric Energy Efficiency (DFEE)												30.7	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1149	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3649	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3102	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3644	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1200	1.0000	2.1200			(26)
TER Opening Type			14.9400	1.1450	17.1069			(27)
Brickwork	62.8700	14.9400	47.9300	0.1800	8.6274			(29a)
Communal Wall	6.9600	2.1200	4.8400	0.1800	0.8712			(29a)
Total net area of external elements Aum(A, m2)			69.8300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.7255			(33)
Main dwelling								
Party Wall 1			43.7600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							269.7540	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.4400	0.0700	2.7608
E16 Corner (normal)	6.3000	0.0900	0.5670
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0900	-0.2835
E18 Party wall between dwellings	9.4500	0.0600	0.5670
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0500	1.6500
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.0200	0.0980

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.8408	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	34.5663	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.2120	33.0376	32.8666	32.0636	31.9134	31.2140	31.2140	31.0845	31.4834	31.9134	32.2173	32.5350	(38)
Heat transfer coeff	67.7782	67.6038	67.4329	66.6299	66.4796	65.7803	65.7803	65.6507	66.0496	66.4796	66.7836	67.1013	(39)
Average = Sum(39)m / 12 =												66.6292	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9929	0.9904	0.9879	0.9761	0.9739	0.9637	0.9637	0.9618	0.9676	0.9739	0.9784	0.9830	(40)
HLP (average)												0.9761	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2032	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)
Average daily hot water use (litres/day)												58.3103	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.6162	61.8713	59.9662	57.5948	55.4794	53.2809	52.8240	54.7252	56.6751	58.9328	61.3252	63.5268	(44)
Energy conte	100.7525	88.1039	92.1658	78.8444	74.6859	65.5151	63.8860	67.7612	69.8861	79.9713	87.3690	99.4677	(45)
Energy content (annual)										Total = Sum(45)m =		968.4090	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	85.6396	74.8883	78.3410	67.0178	63.4830	55.6879	54.3031	57.5970	59.4032	67.9756	74.2637	84.5475	(64)
									Total per year (kWh/year) = Sum(64)m =			823.1476	(64)
12Total per year (kWh/year)												823	(64)
Electric shower(s)	48.9784	43.6401	47.6533	45.4750	46.3283	44.1927	45.6658	46.3283	45.4750	47.6533	46.7573	48.9784	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							557.1259	(64a)
Heat gains from water heating, kWh/month	33.6545	29.6321	31.4986	28.1232	27.4528	24.9701	24.9922	25.9813	26.2195	28.9072	30.2552	33.3815	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	97.4991	107.9455	97.4991	100.7491	97.4991	100.7491	97.4991	97.4991	100.7491	97.4991	100.7491	97.4991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)													
	45.2345	44.0954	42.3368	39.0600	36.8990	34.6808	33.5917	34.9211	36.4160	38.8538	42.0212	44.8676	(72)
Total internal gains													
	391.9833	403.2954	386.0383	375.2561	356.2684	344.5399	331.6763	331.0009	340.7979	350.7411	370.7351	383.0918	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.9400	36.7938	0.6300	0.7000	0.7700	44.3040	(77)
West	11.0000	19.6403	0.6300	0.7000	0.7700	66.0255	(80)

Solar gains	110.3295	204.6260	315.9640	438.1612	523.4912	531.4570	507.6853	443.9740	359.1927	236.6653	135.3921	92.2112	(83)
Total gains	502.3129	607.9214	702.0023	813.4173	879.7596	875.9970	839.3616	774.9749	699.9906	587.4064	506.1272	475.3029	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.4643	75.6590	75.8508	76.7649	76.9384	77.7564	77.7564	77.9098	77.4393	76.9384	76.5882	76.2256	
alpha	6.0310	6.0439	6.0567	6.1177	6.1292	6.1838	6.1838	6.1940	6.1626	6.1292	6.1059	6.0817	
util living area													
	0.9958	0.9867	0.9580	0.8557	0.6766	0.4779	0.3445	0.3890	0.6342	0.9194	0.9886	0.9970	(86)
MIT	20.0405	20.2575	20.5359	20.8321	20.9649	20.9964	20.9996	20.9992	20.9819	20.7694	20.3483	20.0057	(87)
Th 2	20.0892	20.0914	20.0934	20.1033	20.1051	20.1137	20.1137	20.1153	20.1104	20.1051	20.1014	20.0975	(88)
util rest of house													
	0.9944	0.9824	0.9451	0.8201	0.6202	0.4130	0.2753	0.3146	0.5596	0.8891	0.9842	0.9959	(89)
MIT 2	19.2224	19.4382	19.7085	19.9823	20.0851	20.1123	20.1136	20.1151	20.1023	19.9380	19.5377	19.1946	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.5151	19.7313	20.0045	20.2863	20.3999	20.4286	20.4306	20.4314	20.4170	20.2354	19.8277	19.4848	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5151	19.7313	20.0045	20.2863	20.3999	20.4286	20.4306	20.4314	20.4170	20.2354	19.8277	19.4848	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9803	0.9436	0.8279	0.6393	0.4362	0.3001	0.3412	0.5859	0.8941	0.9825	0.9950	(94)
Useful gains	498.9262	595.9370	662.4360	673.3978	562.4100	382.1011	251.8734	264.4389	410.1117	525.1967	497.2661	472.9202	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1031.2511	1002.6554	910.6498	758.6672	578.3635	383.4066	251.9768	264.6635	417.2352	640.5599	850.0015	1025.6275	(97)
Space heating kWh													
	396.0498	273.3148	184.6711	61.3940	11.8694	0.0000	0.0000	0.0000	0.0000	85.8303	253.9695	411.2142	(98a)
Space heating requirement - total per year (kWh/year)												1678.3130	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	396.0498	273.3148	184.6711	61.3940	11.8694	0.0000	0.0000	0.0000	0.0000	85.8303	253.9695	411.2142	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1678.3130	
Space heating per m2											(98c) / (4) =	24.5871	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	618.3344	486.7739	498.9456	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9786	0.9920	0.9864	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	605.0812	482.8679	492.1415	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	987.3321	946.4217	873.0550	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	275.2207	344.8841	283.3996	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	68.8052	86.2210	70.8499	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												225.8761	(107)
Energy for space heating												24.5871	(99)
Energy for space cooling												3.3091	(108)
Total												27.8961	(109)
Fabric Energy Efficiency (TFEE)												27.9	(109)

Full SAP Calculation Printout

Plot Reference	P-44	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-44
Plot Address	Flat 11, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	81 B	**DER**	5.37	**TER**	11.61
Environmental	96 A	**% DER < TER**			53.75
CO_2 Emissions (t/year)	0.3	**DFEE**	30.67	**TFEE**	27.90
Compliance Check	See BREL	**% DFEE < TFEE**			-9.95
% DPER < TPER	9.99	**DPER**	55.30	**TPER**	61.43

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.0630	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.9500 (17)
Infiltration rate		0.1975 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1679 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2140	0.2098	0.2056	0.1847	0.1805	0.1595	0.1595	0.1553	0.1679	0.1805	0.1889	0.1973	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1200	1.2000	2.5440			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	62.8700	20.6600	42.2100	0.2100	8.8641	110.0000	4643.0999	(29a)
Communal Wall	6.9600	2.1200	4.8400	0.2000	0.9680	110.0000	532.4000	(29a)
Total net area of external elements Aum(A, m2)			69.8300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.0326			(33)
Main dwelling								
Party Wall 1			43.7600	0.0000	0.0000	110.0000	4813.5998	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			177.5900			9.0000	1598.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18413.4097 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		269.7540 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	39.4400	0.0380	1.4987	
E16 Corner (normal)	6.3000	0.0540	0.3402	
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055	
E18 Party wall between dwellings	9.4500	0.0380	0.3591	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815	
E4 Jamb	33.0000	0.0160	0.5280	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.5190	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	40.5516	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	(39)
Average = Sum(39)m / 12 =												69.2720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	(40)
HLP (average)												1.0148	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.2032	(42)
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)
Average daily hot water use (litres/day)												114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
										Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
12Total per year (kWh/year)												2222	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4484	107.8893	97.4484	100.6967	97.4484	100.6967	97.4484	97.4484	100.6967	97.4484	100.6967	97.4484	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains	435.0134	445.1807	425.2984	408.1709	385.4533	369.7820	354.2259	355.3466	367.3114	381.6530	407.7002	425.2587	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	126.8606	235.2831	363.2959	503.7918	601.8990	611.0565	583.7249	510.4736	412.9979	272.1207	155.6778	106.0279	(83)

Total gains	561.8740	680.4638	788.5944	911.9627	987.3523	980.8385	937.9508	865.8202	780.3093	653.7737	563.3780	531.2866	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	
alpha	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	
util living area													
	0.9928	0.9784	0.9369	0.8171	0.6334	0.4497	0.3247	0.3674	0.5991	0.8936	0.9822	0.9947	(86)
MIT	20.0936	20.3198	20.5981	20.8592	20.9715	20.9967	20.9996	20.9992	20.9841	20.7939	20.3803	20.0387	(87)
Th 2	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	(88)
util rest of house													
	0.9904	0.9717	0.9191	0.7770	0.5767	0.3855	0.2563	0.2936	0.5242	0.8570	0.9755	0.9930	(89)
MIT 2	19.0303	19.3143	19.6530	19.9443	20.0506	20.0694	20.0709	20.0708	20.0621	19.8851	19.3935	18.9607	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.4107	19.6741	19.9911	20.2716	20.3801	20.4011	20.4031	20.4029	20.3919	20.2102	19.7465	19.3463	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4107	19.6741	19.9911	20.2716	20.3801	20.4011	20.4031	20.4029	20.3919	20.2102	19.7465	19.3463	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9682	0.9174	0.7862	0.5959	0.4085	0.2808	0.3200	0.5506	0.8632	0.9726	0.9911	(94)
Useful gains	555.2511	658.8480	723.4324	716.9826	588.4060	400.6494	263.3479	277.0663	429.6311	564.3183	547.9329	526.5838	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1046.7473	1023.4275	934.5552	787.7355	601.2847	401.8542	263.4506	277.2885	435.8548	665.7168	876.0499	1049.2163	(97)
Space heating kWh													
	365.6732	244.9974	157.0754	50.9421	9.5817	0.0000	0.0000	0.0000	0.0000	75.4405	236.2442	388.8386	(98a)
Space heating requirement - total per year (kWh/year)												1528.7931	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	365.6732	244.9974	157.0754	50.9421	9.5817	0.0000	0.0000	0.0000	0.0000	75.4405	236.2442	388.8386	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1528.7931	
Space heating per m2											(98c) / (4) =	22.3966	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	365.6732	244.9974	157.0754	50.9421	9.5817	0.0000	0.0000	0.0000	0.0000	75.4405	236.2442	388.8386	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	365.6732	244.9974	157.0754	50.9421	9.5817	0.0000	0.0000	0.0000	0.0000	75.4405	236.2442	388.8386	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1528.7931	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												684.8345	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2417.8695	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1528.7931	0.1574	240.6998	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			337.3772	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			366.6074	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.3700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1528.7931	1.5828	2419.8010	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			3462.1223	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			3774.4665	(286)
Dwelling Primary energy Rate (DPER)			55.3000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b) x	2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1149	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3649	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3102	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3955	0.3877	0.3800	0.3412	0.3334	0.2947	0.2947	0.2869	0.3102	0.3334	0.3489	0.3644	(22b)
Effective ac	0.5782	0.5752	0.5722	0.5582	0.5556	0.5434	0.5434	0.5412	0.5481	0.5556	0.5609	0.5664	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1200	1.0000	2.1200			(26)
TER Opening Type			14.9400	1.1450	17.1069			(27)
Brickwork	62.8700	14.9400	47.9300	0.1800	8.6274			(29a)
Communal Wall	6.9600	2.1200	4.8400	0.1800	0.8712			(29a)
Total net area of external elements Aum(A, m2)			69.8300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.7255			(33)
Main dwelling								
Party Wall 1			43.7600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 269.7540 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.4400	0.0700	2.7608
E16 Corner (normal)	6.3000	0.0900	0.5670
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0900	-0.2835
E18 Party wall between dwellings	9.4500	0.0600	0.5670
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0500	1.6500
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.0200	0.0980

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8408 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 34.5663 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.2120	33.0376	32.8666	32.0636	31.9134	31.2140	31.2140	31.0845	31.4834	31.9134	32.2173	32.5350	(38)
Heat transfer coeff	67.7782	67.6038	67.4329	66.6299	66.4796	65.7803	65.7803	65.6507	66.0496	66.4796	66.7836	67.1013	(39)

Average = Sum(39)m / 12 = 66.6292

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9929	0.9904	0.9879	0.9761	0.9739	0.9637	0.9637	0.9618	0.9676	0.9739	0.9784	0.9830	(40)
HLP (average)												0.9761	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day) 114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	244.2086	215.9707	229.2891	201.0606	194.5772	174.9630	172.3298	179.3233	181.4738	202.8156	216.2432	241.4563	(62)
WWHRS	-27.9594	-24.7276	-25.8933	-21.4407	-19.9819	-17.0987	-16.0273	-17.0434	-17.6909	-20.8557	-23.6270	-27.4417	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
										Total per year (kWh/year) = Sum(64)m =		2193.9237	(64)
12Total per year (kWh/year)												2194	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.9825	91.4853	98.0217	87.9331	86.4800	79.2556	79.0828	81.4081	81.4205	89.2193	92.9813	102.0673	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	110.1576	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.4991	107.9455	97.4991	100.7491	97.4991	100.7491	97.4991	97.4991	100.7491	97.4991	100.7491	97.4991	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.2024	195.2072	190.1551	179.3998	165.8230	153.0628	144.5382	142.5334	147.5855	158.3409	171.9176	184.6778	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	34.0158	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	138.4173	136.1389	131.7496	122.1293	116.2366	110.0773	106.2940	109.4195	113.0840	119.9184	129.1407	137.1873	(72)
Total internal gains	488.1661	498.3389	478.4512	461.3254	438.6060	419.9364	404.3786	405.4993	417.4658	434.8057	460.8546	478.4115	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.9400	36.7938	0.6300	0.7000	0.7700	44.3040	(77)
West	11.0000	19.6403	0.6300	0.7000	0.7700	66.0255	(80)

Solar gains	110.3295	204.6260	315.9640	438.1612	523.4912	531.4570	507.6853	443.9740	359.1927	236.6653	135.3921	92.2112 (83)
Total gains	598.4957	702.9649	794.4152	899.4865	962.0973	951.3935	912.0640	849.4733	776.6585	671.4710	596.2467	570.6226 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.4643	75.6590	75.8508	76.7649	76.9384	77.7564	77.7564	77.9098	77.4393	76.9384	76.5882	76.2256	
alpha	6.0310	6.0439	6.0567	6.1177	6.1292	6.1838	6.1838	6.1940	6.1626	6.1292	6.1059	6.0817	
util living area	0.9898	0.9736	0.9307	0.8084	0.6267	0.4409	0.3172	0.3551	0.5775	0.8720	0.9750	0.9921	(86)
MIT	20.1805	20.3860	20.6375	20.8795	20.9766	20.9977	20.9998	20.9995	20.9890	20.8386	20.4716	20.1461	(87)
Th 2	20.0892	20.0914	20.0934	20.1033	20.1051	20.1137	20.1137	20.1153	20.1104	20.1051	20.1014	20.0975	(88)
util rest of house	0.9865	0.9657	0.9118	0.7685	0.5719	0.3806	0.2534	0.2870	0.5071	0.8323	0.9661	0.9895	(89)
MIT 2	19.1541	19.4125	19.7184	19.9953	20.0884	20.1126	20.1136	20.1152	20.1043	19.9623	19.5303	19.1171	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.5213	19.7608	20.0472	20.3116	20.4061	20.4292	20.4307	20.4315	20.4208	20.2758	19.8670	19.4852	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5213	19.7608	20.0472	20.3116	20.4061	20.4292	20.4307	20.4315	20.4208	20.2758	19.8670	19.4852	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9839	0.9623	0.9108	0.7783	0.5907	0.4022	0.2762	0.3114	0.5321	0.8406	0.9632	0.9873	(94)
Useful gains	588.8679	676.4316	723.5211	700.0475	568.2652	382.6166	251.9171	264.5403	413.2253	564.4471	574.3326	563.3524	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1031.6743	1004.6442	913.5256	760.3564	578.7814	383.4480	251.9812	264.6733	417.4859	643.2450	852.6280	1025.6584	(97)
Space heating kWh	329.4479	220.5589	141.3634	43.4224	7.8241	0.0000	0.0000	0.0000	0.0000	58.6257	200.3727	343.9557	(98a)
Space heating requirement - total per year (kWh/year)												1345.5707	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	329.4479	220.5589	141.3634	43.4224	7.8241	0.0000	0.0000	0.0000	0.0000	58.6257	200.3727	343.9557	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1345.5707	
Space heating per m2											(98c) / (4) =	19.7124	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	329.4479	220.5589	141.3634	43.4224	7.8241	0.0000	0.0000	0.0000	0.0000	58.6257	200.3727	343.9557	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	356.9317	238.9587	153.1565	47.0448	8.4768	0.0000	0.0000	0.0000	0.0000	63.5165	217.0885	372.6497	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	216.2492	191.2432	203.3958	179.6199	174.5953	157.8643	156.3025	162.2799	163.7828	181.9600	192.6162	214.0146	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0010	84.3804	83.2601	81.4063	80.1484	79.8000	79.8000	79.8000	79.8000	81.8207	84.1484	85.1179	(217)
Fuel for water heating, kWh/month	254.4077	226.6440	244.2897	220.6463	217.8400	197.8249	195.8678	203.3583	205.2416	222.3885	228.9005	251.4330	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.2584	16.2520	14.6332	10.7209	8.2811	6.7657	7.5543	9.8194	12.7544	16.7345	18.9015	20.8214	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3097	-27.1387	-40.9913	-48.5121	-54.4469	-51.6086	-50.9825	-47.0687	-40.5401	-32.0904	-20.5959	-15.6793	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.6768	-14.3471	-29.0842	-44.5267	-59.7068	-60.2923	-59.5797	-50.0615	-36.1941	-20.7886	-9.0009	-5.2574	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1457.8231	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2668.8425	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	163.4968	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-843.4804	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3532.6820	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1457.8231	0.2100	306.1428	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2668.8425	0.2100	560.4569	(264)
Space and water heating			866.5998	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.4968	0.1443	23.5976	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9643	0.1335	-59.8223	
PV Unit electricity exported	-395.5161	0.1253	-49.5742	
Total			-109.3964	(269)
Total CO2, kg/year			792.7302	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1457.8231	1.1300	1647.3401	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2668.8425	1.1300	3015.7920	(278)
Space and water heating			4663.1321	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.4968	1.5338	250.7769	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-447.9643	1.4935	-669.0306	
PV Unit electricity exported	-395.5161	0.4601	-181.9609	
Total			-850.9914	(283)
Total Primary energy kWh/year			4193.0183	(286)
Target Primary Energy Rate (TPER)			61.4300	(287)

Full SAP Calculation Printout

Plot Reference	P-44	Issued on Date	24/04/2026
Assessment Reference	As Built	Plot Type Ref	P-44
Plot Address	Flat 11, 3 Carters Close, READING, RG1 8GR	SAP Version	10.2

SAP Rating	81 B	DER	5.37	TER	11.61
Environmental	96 A	% DER < TER			53.75
CO_2 Emissions (t/year)	0.3	DFEE	30.67	TFEE	27.90
Compliance Check	See BREL	% DFEE < TFEE			-9.95
% DPER < TPER	9.99	DPER	55.30	TPER	61.43

Assessor Details	Mr. Matthew Fitzpatrick	Assessor ID	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.9500	(17)
Infiltration rate		0.1975	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1679	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2140	0.2098	0.2056	0.1847	0.1805	0.1595	0.1595	0.1553	0.1679	0.1805	0.1889	0.1973	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1200	1.2000	2.5440			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	62.8700	20.6600	42.2100	0.2100	8.8641	110.0000	4643.0999	(29a)
Communal Wall	6.9600	2.1200	4.8400	0.2000	0.9680	110.0000	532.4000	(29a)
Total net area of external elements Aum(A, m2)			69.8300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0326			(33)
Main dwelling								
Party Wall 1			43.7600	0.0000	0.0000	110.0000	4813.5998	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			177.5900			9.0000	1598.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 18413.4097	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	269.7540	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.4400	0.0380	1.4987
E16 Corner (normal)	6.3000	0.0540	0.3402
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055
E18 Party wall between dwellings	9.4500	0.0380	0.3591
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0160	0.5280
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.5190 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.5516 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	(39)
Average = Sum(39)m / 12 =												69.2720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	(40)
HLP (average)												1.0148	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2032 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)
Average daily hot water use (litres/day)												114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
										Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	126.8606	235.2831	363.2959	503.7918	601.8990	611.0565	583.7249	510.4736	412.9979	272.1207	155.6778	106.0279	(83)
Total gains	620.6826	727.2854	839.6100	950.4564	1019.2784	1001.7888	958.5805	887.9959	805.4836	691.4700	607.6418	586.5263	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	
alpha	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	
util living area	0.9882	0.9708	0.9201	0.7967	0.6160	0.4406	0.3177	0.3583	0.5821	0.8725	0.9748	0.9914	(86)
MIT	20.1777	20.3808	20.6491	20.8775	20.9753	20.9970	20.9996	20.9993	20.9863	20.8228	20.4393	20.1189	(87)
Th 2	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	(88)
util rest of house	0.9845	0.9622	0.8992	0.7552	0.5600	0.3776	0.2508	0.2862	0.5086	0.8321	0.9658	0.9886	(89)
MIT 2	19.1363	19.3893	19.7115	19.9621	20.0535	20.0695	20.0709	20.0708	20.0634	19.9143	19.4658	19.0621	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.5088	19.7440	20.0470	20.2896	20.3832	20.4013	20.4032	20.4030	20.3935	20.2393	19.8141	19.4402	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5088	19.7440	20.0470	20.2896	20.3832	20.4013	20.4032	20.4030	20.3935	20.2393	19.8141	19.4402	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9586	0.8986	0.7655	0.5792	0.4001	0.2747	0.3120	0.5346	0.8402	0.9627	0.9861	(94)
Useful gains	609.2808	697.1691	754.4440	727.5609	590.3681	400.7920	263.3612	277.0989	430.6162	580.9614	584.9935	578.3641	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1053.5444	1028.2725	938.4242	788.9812	601.5045	401.8704	263.4522	277.2925	435.9657	667.7352	880.7307	1055.7161	(97)
Space heating kWh	330.5321	222.5015	136.8813	44.2226	8.2855	0.0000	0.0000	0.0000	0.0000	64.5597	212.9308	355.1499	(98a)
Space heating requirement - total per year (kWh/year)												1375.0634	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	330.5321	222.5015	136.8813	44.2226	8.2855	0.0000	0.0000	0.0000	64.5597	212.9308	355.1499	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1375.0634	
Space heating per m2										(98c) / (4) =		20.1445	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	330.5321	222.5015	136.8813	44.2226	8.2855	0.0000	0.0000	0.0000	0.0000	64.5597	212.9308	355.1499	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	330.5321	222.5015	136.8813	44.2226	8.2855	0.0000	0.0000	0.0000	0.0000	64.5597	212.9308	355.1499	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1375.0634 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 684.8345 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 44.1702 (230a)
Total electricity for the above, kWh/year 44.1702 (231)
Electricity for lighting (calculated in Appendix L) 160.0718 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2264.1398 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1375.0634	16.4900	226.7479	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	16.4900	112.9292	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	16.4900	7.2837	(249)
Energy for lighting	160.0718	16.4900	26.3958	(250)
Additional standing charges			0.0000	(251)
Total energy cost			373.3567	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.1867 (257)
SAP value 80.7632
SAP rating (Section 12) 81 (258)
SAP band B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1375.0634	0.1576	216.6594	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			313.3368	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			342.5670	(272)
CO2 emissions per m2			5.0200	(273)
EI value			95.9470	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.9500	(17)
Infiltration rate		0.1975	(18)
Number of sides sheltered		2	(19)

Shelter factor									(20) = 1 - [0.075 x (19)] =			0.8500	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1679	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1805	0.1721	0.1721	0.1595	0.1637	0.1427	0.1427	0.1385	0.1427	0.1595	0.1553	0.1679	(22b)

Mechanical extract ventilation - centralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1200	1.2000	2.5440			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	62.8700	20.6600	42.2100	0.2100	8.8641	110.0000	4643.0999	(29a)
Communal Wall	6.9600	2.1200	4.8400	0.2000	0.9680	110.0000	532.4000	(29a)
Total net area of external elements Aum(A, m2)			69.8300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0326			(33)
Main dwelling								
Party Wall 1			43.7600	0.0000	0.0000	110.0000	4813.5998	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			177.5900			9.0000	1598.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 18413.4097	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	269.7540	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.4400	0.0380	1.4987
E16 Corner (normal)	6.3000	0.0540	0.3402
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055
E18 Party wall between dwellings	9.4500	0.0380	0.3591
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0160	0.5280
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.5190	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	40.5516	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	(39)
Average = Sum(39)m / 12 =												69.2720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	(40)
HLP (average)												1.0148	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2032	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)
Hot water usage for baths	26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)
Hot water usage for other uses	37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)
Average daily hot water use (litres/day)												114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
									Total per year (kWh/year) = Sum(64)m =			2222.4248	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)													
	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains													
	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
West	9.7900	23.8018	0.3300	0.0000	0.7700	59.2102	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	151.6209	245.9086	377.2560	531.5544	619.1745	665.1693	629.0452	563.6716	457.3217	305.3569	183.3342	127.4244	(83)
Total gains	645.4429	737.9108	853.5701	978.2190	1036.5540	1055.9015	1003.9007	941.1939	849.8075	724.7062	635.2982	607.9229	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	
alpha	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	
util living area													
	0.9821	0.9613	0.8942	0.7362	0.5347	0.3408	0.2277	0.2502	0.4854	0.8112	0.9590	0.9865	(86)
MIT	20.2925	20.4696	20.7294	20.9262	20.9896	20.9994	21.0000	20.9999	20.9953	20.8938	20.5593	20.2408	(87)
Th 2	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	(88)
util rest of house													
	0.9763	0.9497	0.8672	0.6881	0.4760	0.2801	0.1636	0.1819	0.4121	0.7585	0.9445	0.9821	(89)
MIT 2	19.2809	19.4988	19.8040	20.0099	20.0645	20.0708	20.0710	20.0710	20.0689	19.9855	19.6125	19.2166	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.6428	19.8461	20.1350	20.3377	20.3955	20.4030	20.4033	20.4033	20.4003	20.3105	19.9512	19.5830	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6428	19.8461	20.1350	20.3377	20.3955	20.4030	20.4033	20.4033	20.4003	20.3105	19.9512	19.5830	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9465	0.8693	0.7024	0.4967	0.3018	0.1865	0.2063	0.4383	0.7731	0.9423	0.9791	(94)
Useful gains	628.0404	698.3976	741.9723	687.1239	514.8694	318.6726	187.2576	194.1776	372.4597	560.2441	598.6300	595.1987	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1007.4108	979.9292	882.1808	723.0409	519.2249	318.8578	187.2649	194.1911	374.0891	610.3175	827.8840	1003.2655	(97)
Space heating kWh													
	282.2516	189.1892	104.3151	25.8602	3.2404	0.0000	0.0000	0.0000	0.0000	37.2546	165.0628	303.6017	(98a)
Space heating requirement - total per year (kWh/year)												1110.7757	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	282.2516	189.1892	104.3151	25.8602	3.2404	0.0000	0.0000	0.0000	0.0000	37.2546	165.0628	303.6017	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1110.7757	
Space heating per m2											(98c) / (4) =	16.2727	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	282.2516	189.1892	104.3151	25.8602	3.2404	0.0000	0.0000	0.0000	0.0000	37.2546	165.0628	303.6017	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	282.2516	189.1892	104.3151	25.8602	3.2404	0.0000	0.0000	0.0000	0.0000	37.2546	165.0628	303.6017	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
224.5651 198.2282 209.6456 182.0507 174.9337 155.9531 152.6863 159.6798 162.4639 183.1721 197.2333 221.8128 (64)
Efficiency of water heater 324.5200 (216)
(217)m 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 (217)
Fuel for water heating, kWh/month
69.1992 61.0835 64.6017 56.0985 53.9054 48.0566 47.0499 49.2049 50.0628 56.4440 60.7769 68.3510 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 3.7514 3.3884 3.7514 3.6304 3.7514 3.6304 3.7514 3.7514 3.6304 3.7514 3.6304 3.7514 (231)
Lighting 19.8340 15.9116 14.3266 10.4963 8.1076 6.6240 7.3961 9.6137 12.4872 16.3839 18.5056 20.3853 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 1110.7757 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 684.8345 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 44.1702 (230a)
Total electricity for the above, kWh/year 44.1702 (231)
Electricity for lighting (calculated in Appendix L) 160.0718 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1999.8522 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1110.7757	27.6700	307.3516	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	27.6700	189.4937	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	27.6700	12.2219	(249)
Energy for lighting	160.0718	27.6700	44.2919	(250)
Additional standing charges			0.0000	(251)
Total energy cost			553.3591	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1110.7757	0.1583	175.8414	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			272.5188	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			301.7490	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1110.7757	1.5860	1761.6722	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			2803.9935	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			3116.3377	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£553	£553	£0
Space heating	£320	£320	£0
Water heating	£189	£189	£0
Lighting	£44	£44	£0
Total cost of fuels	£553	£553	£0
Total cost of uses	£553	£553	£0
Delivered energy	29 kWh/m²	29 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	46 kWh/m²	46 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600 (1b)	x	2.5500 (2b)	=	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	174.0630	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.9500 (17)
Infiltration rate		0.1975 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1679 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2140	0.2098	0.2056	0.1847	0.1805	0.1595	0.1595	0.1553	0.1679	0.1805	0.1889	0.1973	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1200	1.2000	2.5440			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	62.8700	20.6600	42.2100	0.2100	8.8641	110.0000	4643.0999	(29a)
Communal Wall	6.9600	2.1200	4.8400	0.2000	0.9680	110.0000	532.4000	(29a)
Total net area of external elements Aum(A, m2)			69.8300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0326			(33)
Main dwelling								
Party Wall 1			43.7600	0.0000	0.0000	110.0000	4813.5998	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			177.5900			9.0000	1598.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18413.4097 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		269.7540 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	39.4400	0.0380	1.4987
E16 Corner (normal)	6.3000	0.0540	0.3402
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055
E18 Party wall between dwellings	9.4500	0.0380	0.3591
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0160	0.5280
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.5190 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.5516 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	(39)
Average = Sum(39)m / 12 =												69.2720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	(40)
HLP (average)												1.0148	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2032 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day)		114.6970 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	

Distribution loss (46)m = 0.15 x (45)m

29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)

Water storage loss (or HIU loss):		
Store volume		200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.6100 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
									Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains													

	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	19.6403	0.3300	0.0000	0.7700	27.0490	(80)
Southeast	5.4500	36.7938	0.3300	0.0000	0.7700	50.9538	(77)
West	9.7900	19.6403	0.3300	0.0000	0.7700	48.8579	(80)

Solar gains	126.8606	235.2831	363.2959	503.7918	601.8990	611.0565	583.7249	510.4736	412.9979	272.1207	155.6778	106.0279	(83)
Total gains	620.6826	727.2854	839.6100	950.4564	1019.2784	1001.7888	958.5805	887.9959	805.4836	691.4700	607.6418	586.5263	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	
alpha	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	
util living area	0.9882	0.9708	0.9201	0.7967	0.6160	0.4406	0.3177	0.3583	0.5821	0.8725	0.9748	0.9914	(86)
MIT	20.1777	20.3808	20.6491	20.8775	20.9753	20.9970	20.9996	20.9993	20.9863	20.8228	20.4393	20.1189	(87)
Th 2	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	(88)
util rest of house	0.9845	0.9622	0.8992	0.7552	0.5600	0.3776	0.2508	0.2862	0.5086	0.8321	0.9658	0.9886	(89)
MIT 2	19.1363	19.3893	19.7115	19.9621	20.0535	20.0695	20.0709	20.0708	20.0634	19.9143	19.4658	19.0621	(90)
Living area fraction									fLA = Living area / (4) =			0.3577	(91)
MIT	19.5088	19.7440	20.0470	20.2896	20.3832	20.4013	20.4032	20.4030	20.3935	20.2393	19.8141	19.4402	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5088	19.7440	20.0470	20.2896	20.3832	20.4013	20.4032	20.4030	20.3935	20.2393	19.8141	19.4402	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9586	0.8986	0.7655	0.5792	0.4001	0.2747	0.3120	0.5346	0.8402	0.9627	0.9861	(94)
Useful gains	609.2808	697.1691	754.4440	727.5609	590.3681	400.7920	263.3612	277.0989	430.6162	580.9614	584.9935	578.3641	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1053.5444	1028.2725	938.4242	788.9812	601.5045	401.8704	263.4522	277.2925	435.9657	667.7352	880.7307	1055.7161	(97)
Space heating kWh	330.5321	222.5015	136.8813	44.2226	8.2855	0.0000	0.0000	0.0000	0.0000	64.5597	212.9308	355.1499	(98a)
Space heating requirement - total per year (kWh/year)												1375.0634	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	330.5321	222.5015	136.8813	44.2226	8.2855	0.0000	0.0000	0.0000	0.0000	64.5597	212.9308	355.1499	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1375.0634	
Space heating per m2											(98c) / (4) =	20.1445	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	330.5321	222.5015	136.8813	44.2226	8.2855	0.0000	0.0000	0.0000	0.0000	64.5597	212.9308	355.1499	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	330.5321	222.5015	136.8813	44.2226	8.2855	0.0000	0.0000	0.0000	0.0000	64.5597	212.9308	355.1499	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1375.0634	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	684.8345	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	44.1702	(230a)
Total electricity for the above, kWh/year	44.1702	(231)
Electricity for lighting (calculated in Appendix L)	160.0718	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2264.1398	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1375.0634	16.4900	226.7479	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	16.4900	112.9292	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	16.4900	7.2837	(249)
Energy for lighting	160.0718	16.4900	26.3958	(250)
Additional standing charges			0.0000	(251)
Total energy cost			373.3567	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1867	(257)
SAP value		80.7632	
SAP rating (Section 12)		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1375.0634	0.1576	216.6594	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			313.3368	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			342.5670	(272)
CO2 emissions per m2			5.0200	(273)
EI value			95.9470	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	68.2600	(1b)	x 2.5500	(2b) =	174.0630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		174.0630	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.9500	(17)
Infiltration rate		0.1975	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1679	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1805	0.1721	0.1721	0.1595	0.1637	0.1427	0.1427	0.1385	0.1427	0.1595	0.1553	0.1679	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1200	1.2000	2.5440			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			15.2400	1.1450	17.4504			(27)
Brickwork	62.8700	20.6600	42.2100	0.2100	8.8641	110.0000	4643.0999	(29a)
Communal Wall	6.9600	2.1200	4.8400	0.2000	0.9680	110.0000	532.4000	(29a)
Total net area of external elements Aum(A, m2)			69.8300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0326			(33)
Main dwelling								
Party Wall 1			43.7600	0.0000	0.0000	110.0000	4813.5998	(32)
Party Floor 1			68.2600			70.0000	4778.2000	(32d)
Party Ceiling 1			68.2600			30.0000	2047.8000	(32b)
Internal Wall 1			177.5900			9.0000	1598.3100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18413.4097 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		269.7540 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	39.4400	0.0380	1.4987
E16 Corner (normal)	6.3000	0.0540	0.3402
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0970	-0.3055
E18 Party wall between dwellings	9.4500	0.0380	0.3591
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.6800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	9.6300	0.0500	0.4815
E4 Jamb	33.0000	0.0160	0.5280
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9000	0.3300	1.6170

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.5190 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.5516 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	28.7204	(38)
Heat transfer coeff	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	69.2720	(39)
Average = Sum(39)m / 12 =												69.2720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	1.0148	(40)
HLP (average)												1.0148	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2032	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
61.1592	60.2401	58.9008	56.3383	54.4472	52.3383	51.1395	52.4687	53.9258	56.1901	58.8077	60.9249	(42a)

Hot water usage for baths

26.4237	26.0313	25.4786	24.4597	23.6967	22.8507	22.3938	22.9425	23.5400	24.4453	25.4852	26.3344	(42b)

Hot water usage for other uses

37.1925	35.8400	34.4876	33.1351	31.7827	30.4302	30.4302	31.7827	33.1351	34.4876	35.8400	37.1925	(42c)

Average daily hot water use (litres/day)	114.6970	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.7754	122.1114	118.8670	113.9331	109.9266	105.6192	103.9635	107.1939	110.6009	115.1229	120.1329	124.4517	(44)
Energy conte	197.6137	173.8850	182.6942	155.9687	147.9823	129.8711	125.7349	132.7284	136.3819	156.2207	171.1513	194.8614	(45)
Energy content (annual)										Total = Sum(45)m =		1905.0938	
Distribution loss (46)m = 0.15 x (45)m	29.6421	26.0828	27.4041	23.3953	22.1973	19.4807	18.8602	19.9093	20.4573	23.4331	25.6727	29.2292	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)
Total storage loss		

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
										Total per year (kWh/year) = Sum(64)m =		2222.4248	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	65.7066	57.8168	60.7458	51.8596	49.2041	43.1821	41.8068	44.1322	45.3470	51.9434	56.9078	64.7914	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	132.1891	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.6598	20.1262	16.3678	12.3914	9.2628	7.8200	8.4498	10.9834	14.7418	18.7182	21.8469	23.2896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	288.3618	291.3541	283.8136	267.7608	247.4971	228.4520	215.7287	212.7364	220.2769	236.3297	256.5934	275.6385	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	50.4221	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	-88.1260	(71)
Water heating gains (Table 5)													
	88.3153	86.0369	81.6476	72.0272	66.1346	59.9752	56.1920	59.3175	62.9819	69.8164	79.0386	87.0852	(72)
Total internal gains													
	493.8220	492.0023	476.3141	446.6646	417.3795	390.7323	374.8555	377.5223	392.4857	419.3493	451.9640	480.4984	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.4200	23.8018	0.3300	0.0000	0.7700	32.7803	(80)
Southeast	5.4500	43.0593	0.3300	0.0000	0.7700	59.6304	(77)
West	9.7900	23.8018	0.3300	0.0000	0.7700	59.2102	(80)

Solar gains	151.6209	245.9086	377.2560	531.5544	619.1745	665.1693	629.0452	563.6716	457.3217	305.3569	183.3342	127.4244	(83)
Total gains	645.4429	737.9108	853.5701	978.2190	1036.5540	1055.9015	1003.9007	941.1939	849.8075	724.7062	635.2982	607.9229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	73.8370	
alpha	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	5.9225	
util living area													
	0.9821	0.9613	0.8942	0.7362	0.5347	0.3408	0.2277	0.2502	0.4854	0.8112	0.9590	0.9865	(86)
MIT	20.2925	20.4696	20.7294	20.9262	20.9896	20.9994	21.0000	20.9999	20.9953	20.8938	20.5593	20.2408	(87)
Th 2	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	20.0710	(88)
util rest of house													
	0.9763	0.9497	0.8672	0.6881	0.4760	0.2801	0.1636	0.1819	0.4121	0.7585	0.9445	0.9821	(89)
MIT 2	19.2809	19.4988	19.8040	20.0099	20.0645	20.0708	20.0710	20.0710	20.0689	19.9855	19.6125	19.2166	(90)
Living area fraction										fLA = Living area / (4) =		0.3577	(91)
MIT	19.6428	19.8461	20.1350	20.3377	20.3955	20.4030	20.4033	20.4033	20.4003	20.3105	19.9512	19.5830	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6428	19.8461	20.1350	20.3377	20.3955	20.4030	20.4033	20.4033	20.4003	20.3105	19.9512	19.5830	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9465	0.8693	0.7024	0.4967	0.3018	0.1865	0.2063	0.4383	0.7731	0.9423	0.9791	(94)
Useful gains	628.0404	698.3976	741.9723	687.1239	514.8694	318.6726	187.2576	194.1776	372.4597	560.2441	598.6300	595.1987	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1007.4108	979.9292	882.1808	723.0409	519.2249	318.8578	187.2649	194.1911	374.0891	610.3175	827.8840	1003.2655	(97)
Space heating kWh													
	282.2516	189.1892	104.3151	25.8602	3.2404	0.0000	0.0000	0.0000	0.0000	37.2546	165.0628	303.6017	(98a)
Space heating requirement - total per year (kWh/year)												1110.7757	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	282.2516	189.1892	104.3151	25.8602	3.2404	0.0000	0.0000	0.0000	0.0000	37.2546	165.0628	303.6017	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1110.7757	
Space heating per m2											(98c) / (4) =	16.2727	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)

Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	282.2516	189.1892	104.3151	25.8602	3.2404	0.0000	0.0000	0.0000	0.0000	37.2546	165.0628	303.6017	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	282.2516	189.1892	104.3151	25.8602	3.2404	0.0000	0.0000	0.0000	0.0000	37.2546	165.0628	303.6017	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	224.5651	198.2282	209.6456	182.0507	174.9337	155.9531	152.6863	159.6798	162.4639	183.1721	197.2333	221.8128	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	69.1992	61.0835	64.6017	56.0985	53.9054	48.0566	47.0499	49.2049	50.0628	56.4440	60.7769	68.3510	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7514	3.3884	3.7514	3.6304	3.7514	3.6304	3.7514	3.7514	3.6304	3.7514	3.6304	3.7514	(231)
Lighting	19.8340	15.9116	14.3266	10.4963	8.1076	6.6240	7.3961	9.6137	12.4872	16.3839	18.5056	20.3853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1110.7757 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	684.8345 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)	
mechanical ventilation fans (SFP = 0.2080)	44.1702 (230a)
Total electricity for the above, kWh/year	44.1702 (231)
Electricity for lighting (calculated in Appendix L)	160.0718 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1999.8522 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1110.7757	27.6700	307.3516	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	27.6700	189.4937	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	44.1702	27.6700	12.2219	(249)
Energy for lighting	160.0718	27.6700	44.2919	(250)
Additional standing charges			0.0000	(251)
Total energy cost			553.3591	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1110.7757	0.1583	175.8414	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	684.8345	0.1412	96.6773	(264)
Space and water heating			272.5188	(265)
Pumps, fans and electric keep-hot	44.1702	0.1387	6.1270	(267)
Energy for lighting	160.0718	0.1443	23.1033	(268)
Total CO2, kg/year			301.7490	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1110.7757	1.5860	1761.6722	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	684.8345	1.5220	1042.3214	(278)
Space and water heating			2803.9935	(279)
Pumps, fans and electric keep-hot	44.1702	1.5128	66.8207	(281)
Energy for lighting	160.0718	1.5338	245.5234	(282)
Total Primary energy kWh/year			3116.3377	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-45	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-45
Plot Address	Flat 12, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	79 C	**DER**	6.60	**TER**	14.68
Environmental	96 A	**% DER < TER**			55.04
CO_2 Emissions (t/year)	0.29	**DFEE**	36.18	**TFEE**	35.69
Compliance Check	See BREL	**% DFEE < TFEE**			-1.38
% DPER < TPER	13.05	**DPER**	68.00	**TPER**	78.20

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	3	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	292.16	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	25.82 m	52.47 m²	2.55 m

8.0 Living Area 23.74 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	44.65	32.16	0.00	None	12.49	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	30.04	27.89	0.90	Stairwell Access Corridor 4	2.15	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.04	6.04	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	16.07	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	116.13

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete plank floor (screed laid on rubber), carpeted	30.00	52.47

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	52.47

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.15	
Patio Door	Patio Door	Brickwork	North West	5.42	
West	Window	Brickwork	West	7.07	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	47.87	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	8.55	0.05	0.05	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	2.85	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	10.20	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	6.23	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.60	0.02	0.02	RCD	Yes
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	3.77	0.33	0.33	AbbeyCalculated	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	6.30	-0.10	-0.10	RCD	No

Y-value	0.04	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	

Summary for Input Data

elmhurst energy

Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.81	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L

Summary for Input Data

Loss	1.61	kWh/day

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-45	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-45
Plot Address	Flat 12, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	79 C	**DER**	6.60	**TER**	14.68
Environmental	96 A	**% DER < TER**			55.04
CO_2 Emissions (t/year)	0.29	**DFEE**	36.18	**TFEE**	35.69
Compliance Check	See BREL	**% DFEE < TFEE**			-1.38
% DPER < TPER	13.05	**DPER**	68.00	**TPER**	78.20

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

			Area		Storey height		Volume
Main dwelling			(m2)		(m)		(m3)
Ground floor			52.4700	(1b) x	2.5500	(2b) =	133.7985 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)		52.4700					(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.8100 (17)
Infiltration rate			0.1405 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1194 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.1523	0.1493	0.1463	0.1314	0.1284	0.1135	0.1135	0.1105	0.1194	0.1284	0.1344	0.1403	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	44.6500	12.4900	32.1600	0.2100	6.7536	110.0000	3537.6002	(29a)
Communal Wall	30.0400	2.1500	27.8900	0.2000	5.5780	110.0000	3067.9001	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			80.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1795			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000	110.0000	1767.7000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15329.7702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	292.1626 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.6312 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.8107 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	(39)
Average = Sum(39)m / 12 =												55.8874	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	(40)
HLP (average)												1.0651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7629 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)		100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)											Total = Sum(45)m =	1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):		
Store volume		200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.6100 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
										Total per year (kWh/year) = Sum(64)m =		1992.4381	(64)
12Total per year (kWh/year)												1992	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	358.2381	366.1326	349.9525	335.5235	316.9621	303.9820	291.2929	292.4466	302.2694	314.2488	335.7378	350.3773	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains 50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)

Total gains	409.0607	466.7849	520.6096	594.8937	645.9354	646.0823	614.7651	562.5539	503.9121	434.8039	399.2844	392.0828	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	
alpha	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	
util living area	0.9963	0.9910	0.9746	0.9075	0.7513	0.5467	0.3991	0.4549	0.7237	0.9505	0.9914	0.9971	(86)
MIT	20.0391	20.2010	20.4463	20.7507	20.9370	20.9919	20.9990	20.9978	20.9617	20.6931	20.3037	19.9985	(87)
Th 2	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	(88)
util rest of house	0.9949	0.9877	0.9653	0.8771	0.6902	0.4671	0.3116	0.3601	0.6390	0.9269	0.9877	0.9960	(89)
MIT 2	18.9222	19.1277	19.4347	19.7944	19.9832	20.0256	20.0292	20.0288	20.0075	19.7387	19.2597	18.8706	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.4275	19.6133	19.8924	20.2271	20.4148	20.4628	20.4679	20.4672	20.4392	20.1705	19.7320	19.3809	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4275	19.6133	19.8924	20.2271	20.4148	20.4628	20.4679	20.4672	20.4392	20.1705	19.7320	19.3809	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9937	0.9859	0.9637	0.8840	0.7155	0.5031	0.3512	0.4031	0.6763	0.9310	0.9862	0.9951	(94)
Useful gains	406.4888	460.2101	501.7268	525.8782	462.1437	325.0310	215.9257	226.7573	340.8168	404.7862	393.7609	390.1427	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	845.4396	822.2895	748.4681	633.0436	487.0455	327.6553	216.1696	227.3067	354.2825	534.8714	705.9727	848.4233	(97)
Space heating kWh	326.5794	243.3173	183.5755	77.1591	18.5269	0.0000	0.0000	0.0000	0.0000	96.7834	224.7925	340.9607	(98a)
Space heating requirement - total per year (kWh/year)												1511.6948	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	326.5794	243.3173	183.5755	77.1591	18.5269	0.0000	0.0000	0.0000	0.0000	96.7834	224.7925	340.9607	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1511.6948	
Space heating per m2											(98c) / (4) =	28.8106	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	326.5794	243.3173	183.5755	77.1591	18.5269	0.0000	0.0000	0.0000	0.0000	96.7834	224.7925	340.9607	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	326.5794	243.3173	183.5755	77.1591	18.5269	0.0000	0.0000	0.0000	0.0000	96.7834	224.7925	340.9607	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1511.6948	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)

mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2286.9096	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1511.6948	0.1564	236.4124	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			323.0561	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			346.1387	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.6000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1511.6948	1.5790	2386.9239	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			3321.2724	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			3567.8890	(286)
Dwelling Primary energy Rate (DPER)			68.0000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3995	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)
Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			10.9600	1.1450	12.5496			(27)
Brickwork	44.6500	10.9600	33.6900	0.1800	6.0642			(29a)
Communal Wall	30.0400	2.1500	27.8900	0.1800	5.0202			(29a)
Lift Shaft Wall	6.0400		6.0400	0.1800	1.0872			(29a)
Total net area of external elements Aum(A, m2)			80.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8712			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 292.1626 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0700	3.3509
E16 Corner (normal)	8.5500	0.0900	0.7695
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0500	0.9300
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.0200	0.0754
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0413 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.9125 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	58.1272	57.9665	57.8090	57.0692	56.9308	56.2865	56.2865	56.1672	56.5347	56.9308	57.2108	57.5035	(39)
Average = Sum(39)m / 12 =												57.0686	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1078	1.1048	1.1018	1.0877	1.0850	1.0727	1.0727	1.0705	1.0775	1.0850	1.0904	1.0959	(40)
HLP (average)												1.0876	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers												
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)
Hot water usage for baths												
23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)
Hot water usage for other uses												
32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m													
	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	220.3518	194.9791	207.2344	182.2321	176.7131	159.2853	157.1511	163.3000	165.0091	183.9559	195.5810	217.9316	(62)
WWHRS	-24.5851	-21.7433	-22.7683	-18.8531	-17.5704	-15.0351	-14.0930	-14.9865	-15.5559	-18.3387	-20.7755	-24.1298	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
										Total per year (kWh/year) = Sum(64)m =		1995.2899	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.0501	84.5056	90.6886	81.6726	80.5402	74.0428	74.0358	76.0804	75.9460	82.9484	86.1111	94.2454	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.7386	86.0677	77.7386	80.3299	77.7386	80.3299	77.7386	77.7386	80.3299	77.7386	80.3299	77.7386	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	127.7555	125.7524	121.8932	113.4342	108.2530	102.8372	99.5106	102.2586	105.4805	111.4898	119.5988	126.6739	(72)
Total internal gains													

	411.5827	419.5031	403.2971	388.8761	370.3067	354.3346	341.6375	342.7911	352.6221	367.5934	389.0905	403.7219 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2000	19.6403	0.6300	0.7000	0.7700	37.2144	(80)
Northwest	4.7600	11.2829	0.6300	0.7000	0.7700	16.4135	(81)

Solar gains	53.6279	106.2094	180.0844	273.7090	347.1708	361.0290	341.3682	285.0436	212.7849	127.2123	67.0544	44.0074	(83)
Total gains	465.2106	525.7125	583.3815	662.5851	717.4775	715.3637	683.0056	627.8347	565.4069	494.8056	456.1449	447.7293	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.2578	73.4609	73.6610	74.6159	74.7973	75.6535	75.6535	75.8142	75.3214	74.7973	74.4312	74.0523	
alpha	5.8839	5.8974	5.9107	5.9744	5.9865	6.0436	6.0436	6.0543	6.0214	5.9865	5.9621	5.9368	
util living area													
	0.9931	0.9849	0.9611	0.8737	0.7023	0.4996	0.3621	0.4104	0.6652	0.9215	0.9842	0.9944	(86)
MIT	20.0767	20.2455	20.4958	20.7967	20.9534	20.9948	20.9994	20.9987	20.9745	20.7520	20.3697	20.0529	(87)
Th 2	19.9945	19.9970	19.9994	20.0109	20.0131	20.0232	20.0232	20.0250	20.0193	20.0131	20.0087	20.0042	(88)
util rest of house													
	0.9906	0.9796	0.9478	0.8371	0.6400	0.4253	0.2820	0.3241	0.5813	0.8887	0.9776	0.9924	(89)
MIT 2	18.9431	19.1578	19.4691	19.8253	19.9801	20.0208	20.0230	20.0247	20.0053	19.7883	19.3254	18.9203	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.4560	19.6500	19.9337	20.2648	20.4205	20.4615	20.4648	20.4654	20.4438	20.2243	19.7979	19.4327	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4560	19.6500	19.9337	20.2648	20.4205	20.4615	20.4648	20.4654	20.4438	20.2243	19.7979	19.4327	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9888	0.9773	0.9468	0.8473	0.6665	0.4589	0.3183	0.3632	0.6187	0.8967	0.9758	0.9908	(94)
Useful gains	460.0196	513.7959	552.3223	561.4149	478.1992	328.2605	217.3867	228.0223	349.8261	443.6765	445.1260	443.6176	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	880.9733	855.0039	776.5859	648.5827	496.4643	329.9215	217.5340	228.3409	358.6471	547.9211	726.4547	875.9358	(97)
Space heating kWh													
	313.1895	229.2918	166.8522	62.7608	13.5893	0.0000	0.0000	0.0000	0.0000	77.5580	202.5567	321.6448	(98a)
Space heating requirement - total per year (kWh/year)												1387.4429	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	313.1895	229.2918	166.8522	62.7608	13.5893	0.0000	0.0000	0.0000	0.0000	77.5580	202.5567	321.6448	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1387.4429	
Space heating per m2											(98c) / (4) =	26.4426	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	313.1895	229.2918	166.8522	62.7608	13.5893	0.0000	0.0000	0.0000	0.0000	77.5580	202.5567	321.6448	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	339.3169	248.4201	180.7716	67.9965	14.7229	0.0000	0.0000	0.0000	0.0000	84.0281	219.4547	348.4775	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1079	84.6894	83.8354	82.1096	80.4414	79.8000	79.8000	79.8000	79.8000	82.4657	84.3911	85.1876	(217)
Fuel for water heating, kWh/month													
	230.0216	204.5544	220.0336	198.9769	197.8368	180.7647	179.2708	185.8566	187.2847	200.8316	207.1374	227.4998	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1525	12.9582	11.6674	8.5480	6.6027	5.3945	6.0232	7.8292	10.1694	13.3428	15.0707	16.6015	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1918	-21.0989	-31.9695	-37.9682	-42.7446	-40.5816	-40.1067	-36.9732	-31.7519	-25.0213	-15.9915	-12.1471	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0148	-10.7903	-21.8961	-33.5488	-45.0029	-45.4342	-44.8801	-37.6887	-27.2320	-15.6256	-6.7590	-3.9465	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1503.1884	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2420.0690	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3603	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-648.3653	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3491.2524	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1503.1884	0.2100	315.6696	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2420.0690	0.2100	508.2145	(264)
Space and water heating			823.8841	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3603	0.1443	18.8150	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5464	0.1335	-46.7861	
PV Unit electricity exported	-297.8189	0.1253	-37.3248	
Total			-84.1110	(269)
Total CO2, kg/year			770.5174	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1503.1884	1.1300	1698.6029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2420.0690	1.1300	2734.6780	(278)
Space and water heating			4433.2809	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.3603	1.5338	199.9509	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5464	1.4932	-523.4376	
PV Unit electricity exported	-297.8189	0.4600	-137.0000	
Total			-660.4376	(283)
Total Primary energy kWh/year			4102.8950	(286)
Target Primary Energy Rate (TPER)			78.2000	(287)

Full SAP Calculation Printout

Plot Reference	P-45	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-45
Plot Address	Flat 12, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	79 C	**DER**	6.60	**TER**	14.68
Environmental	96 A	**% DER < TER**			55.04
CO_2 Emissions (t/year)	0.29	**DFEE**	36.18	**TFEE**	35.69
Compliance Check	See BREL	**% DFEE < TFEE**			-1.38
% DPER < TPER	13.05	**DPER**	68.00	**TPER**	78.20

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700 (1b)	x	2.5500 (2b)	=	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8100	(17)
Infiltration rate		0.2900	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2465	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3143	0.3081	0.3019	0.2711	0.2650	0.2342	0.2342	0.2280	0.2465	0.2650	0.2773	0.2896	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5494	0.5475	0.5456	0.5368	0.5351	0.5274	0.5274	0.5260	0.5304	0.5351	0.5384	0.5419	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	44.6500	12.4900	32.1600	0.2100	6.7536	110.0000	3537.6002	(29a)
Communal Wall	30.0400	2.1500	27.8900	0.2000	5.5780	110.0000	3067.9001	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			80.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1795			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000	110.0000	1767.7000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15329.7702	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							292.1626	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.6312 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.8107 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.2571	24.1724	24.0894	23.6996	23.6267	23.2872	23.2872	23.2243	23.4180	23.6267	23.7743	23.9285	(38)
Heat transfer coeff	58.0678	57.9831	57.9001	57.5103	57.4374	57.0979	57.0979	57.0350	57.2287	57.4374	57.5849	57.7392	(39)
Average = Sum(39)m / 12 =												57.5100	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1067	1.1051	1.1035	1.0961	1.0947	1.0882	1.0882	1.0870	1.0907	1.0947	1.0975	1.1004	(40)
HLP (average)												1.0961	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 51.2690 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.9338	54.4000	52.7252	50.6402	48.7804	46.8475	46.4454	48.1167	49.8310	51.8160	53.9195	55.8552	(44)
Energy conte	88.5855	77.4649	81.0367	69.3239	65.6677	57.6044	56.1717	59.5786	61.4466	70.3138	76.8182	87.4557	(45)
Energy content (annual)										Total = Sum(45)m =		851.4677	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(64)
										Total per year (kWh/year) = Sum(64)m =		723.7475	(64)
12Total per year (kWh/year)												724	(64)
Electric shower(s)	43.0673	38.3733	41.9022	39.9868	40.7371	38.8592	40.1546	40.7371	39.9868	41.9022	41.1143	43.0673	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		489.8882	(64a)
Heat gains from water heating, kWh/month	29.5912	26.0546	27.6959	24.7280	24.1387	21.9557	21.9751	22.8447	23.0541	25.4172	26.6024	29.3512	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	39.7732	38.7718	37.2256	34.3445	32.4444	30.4941	29.5364	30.7053	32.0196	34.1630	36.9478	39.4505	(72)
Total internal gains	320.3579	329.2540	315.3870	306.5358	291.2556	281.7409	271.4208	270.9953	278.9105	287.0240	303.1890	313.2560	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)
Total gains	371.1805	429.9062	486.0441	565.9060	620.2289	623.8412	594.8931	541.1027	480.5532	407.5791	366.7355	354.9614	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	73.3327	73.4398	73.5451	74.0436	74.1376	74.5784	74.5784	74.6606	74.4080	74.1376	73.9476	73.7501	
alpha	5.8888	5.8960	5.9030	5.9362	5.9425	5.9719	5.9719	5.9774	5.9605	5.9425	5.9298	5.9167	
util living area	0.9978	0.9944	0.9829	0.9281	0.7850	0.5756	0.4209	0.4815	0.7607	0.9648	0.9947	0.9983	(86)
MIT	19.9120	20.0812	20.3428	20.6897	20.9140	20.9884	20.9985	20.9967	20.9466	20.6287	20.2080	19.8813	(87)
Th 2	19.9954	19.9967	19.9980	20.0041	20.0052	20.0105	20.0105	20.0115	20.0084	20.0052	20.0029	20.0005	(88)
util rest of house	0.9970	0.9923	0.9762	0.9021	0.7246	0.4914	0.3271	0.3799	0.6755	0.9464	0.9922	0.9977	(89)
MIT 2	19.0127	19.1818	19.4403	19.7711	19.9550	20.0062	20.0102	20.0107	19.9839	19.7242	19.3136	18.9862	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.4196	19.5887	19.8486	20.1867	20.3889	20.4506	20.4573	20.4568	20.4195	20.1334	19.7183	19.3912	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4196	19.5887	19.8486	20.1867	20.3889	20.4506	20.4573	20.4568	20.4195	20.1334	19.7183	19.3912	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9964	0.9911	0.9750	0.9075	0.7492	0.5294	0.3696	0.4261	0.7129	0.9492	0.9913	0.9972	(94)
Useful gains	369.8306	426.0911	473.8784	513.5590	464.6656	330.2848	219.8775	230.5549	342.5765	386.8911	363.5578	353.9586	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.9605	851.6976	772.8882	649.1041	499.0680	334.0565	220.2452	231.3825	361.6554	547.5766	726.6234	877.1269	(97)
Space heating kWh	378.0487	286.0076	222.4633	97.5924	25.5953	0.0000	0.0000	0.0000	0.0000	119.5500	261.4072	389.2372	(98a)
Space heating requirement - total per year (kWh/year)												1779.9018	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	378.0487	286.0076	222.4633	97.5924	25.5953	0.0000	0.0000	0.0000	0.0000	119.5500	261.4072	389.2372	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1779.9018	
Space heating per m2											(98c) / (4) =	33.9223	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	536.7203	422.5245	433.4663	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9438	0.9753	0.9580	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	506.5627	412.1000	415.2502	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	701.4083	669.1055	607.7169	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	140.2889	191.2121	143.1952	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.0722	47.8030	35.7988	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												118.6740	(107)
Energy for space heating												33.9223	(99)
Energy for space cooling												2.2618	(108)
Total												36.1840	(109)
Fabric Energy Efficiency (DFEE)												36.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	133.7985	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3995	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			10.9600	1.1450	12.5496			(27)
Brickwork	44.6500	10.9600	33.6900	0.1800	6.0642			(29a)
Communal Wall	30.0400	2.1500	27.8900	0.1800	5.0202			(29a)
Lift Shaft Wall	6.0400		6.0400	0.1800	1.0872			(29a)
Total net area of external elements Aum(A, m2)			80.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8712			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	292.1626	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0700	3.3509
E16 Corner (normal)	8.5500	0.0900	0.7695
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0500	0.9300
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.0200	0.0754
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.0413	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	31.9125	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	58.1272	57.9665	57.8090	57.0692	56.9308	56.2865	56.2865	56.1672	56.5347	56.9308	57.2108	57.5035	(39)
Average = Sum(39)m / 12 =												57.0686	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1078	1.1048	1.1018	1.0877	1.0850	1.0727	1.0727	1.0705	1.0775	1.0850	1.0904	1.0959	(40)
HLP (average)												1.0876	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7629	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

	32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)	51.2690	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.9338	54.4000	52.7252	50.6402	48.7804	46.8475	46.4454	48.1167	49.8310	51.8160	53.9195	55.8552	(44)
Energy conte	88.5855	77.4649	81.0367	69.3239	65.6677	57.6044	56.1717	59.5786	61.4466	70.3138	76.8182	87.4557	(45)

Energy content (annual) Total = Sum(45)m =	851.4677	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(64)

Total per year (kWh/year) = Sum(64)m =	723.7475	(64)
12Total per year (kWh/year)	724	(64)

Electric shower(s)

	43.0673	38.3733	41.9022	39.9868	40.7371	38.8592	40.1546	40.7371	39.9868	41.9022	41.1143	43.0673	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	489.8882	(64a)

Heat gains from water heating, kWh/month

	29.5912	26.0546	27.6959	24.7280	24.1387	21.9557	21.9751	22.8447	23.0541	25.4172	26.6024	29.3512	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	77.7386	86.0677	77.7386	80.3299	77.7386	80.3299	77.7386	77.7386	80.3299	77.7386	80.3299	77.7386	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)

Water heating gains (Table 5)

	39.7732	38.7718	37.2256	34.3445	32.4444	30.4941	29.5364	30.7053	32.0196	34.1630	36.9478	39.4505	(72)

Total internal gains

	320.6004	329.5225	315.6295	306.7864	291.4982	281.9915	271.6634	271.2378	279.1611	287.2665	303.4396	313.4985	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2000	19.6403	0.6300	0.7000	0.7700	37.2144	(80)
Northwest	4.7600	11.2829	0.6300	0.7000	0.7700	16.4135	(81)

Solar gains	53.6279	106.2094	180.0844	273.7090	347.1708	361.0290	341.3682	285.0436	212.7849	127.2123	67.0544	44.0074	(83)
Total gains	374.2283	435.7318	495.7139	580.4953	638.6689	643.0205	613.0315	556.2814	491.9460	414.4787	370.4939	357.5059	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.2578	73.4609	73.6610	74.6159	74.7973	75.6535	75.6535	75.8142	75.3214	74.7973	74.4312	74.0523	
alpha	5.8839	5.8974	5.9107	5.9744	5.9865	6.0436	6.0436	6.0543	6.0214	5.9865	5.9621	5.9368	
util living area	0.9977	0.9940	0.9812	0.9195	0.7658	0.5527	0.4030	0.4621	0.7424	0.9613	0.9943	0.9983	(86)
MIT	19.9158	20.0918	20.3608	20.7146	20.9265	20.9911	20.9989	20.9976	20.9547	20.6473	20.2231	19.8922	(87)
Th 2	19.9945	19.9970	19.9994	20.0109	20.0131	20.0232	20.0232	20.0250	20.0193	20.0131	20.0087	20.0042	(88)
util rest of house	0.9969	0.9917	0.9739	0.8916	0.7046	0.4719	0.3141	0.3655	0.6573	0.9416	0.9918	0.9976	(89)
MIT 2	19.0158	19.1925	19.4587	19.7987	19.9708	20.0199	20.0229	20.0245	19.9987	19.7478	19.3333	19.0001	(90)
Living area fraction									fLA = Living area / (4) =			0.4524	(91)
MIT	19.4230	19.5994	19.8669	20.2131	20.4032	20.4593	20.4645	20.4648	20.4312	20.1548	19.7359	19.4037	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4230	19.5994	19.8669	20.2131	20.4032	20.4593	20.4645	20.4648	20.4312	20.1548	19.7359	19.4037	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9962	0.9905	0.9727	0.8979	0.7300	0.5084	0.3544	0.4093	0.6949	0.9450	0.9909	0.9971	(94)
Useful gains	372.8116	431.6127	482.1982	521.2537	466.2091	326.9349	217.2513	227.6917	341.8417	391.6880	367.1048	356.4584	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	879.0582	852.0727	772.7247	645.6288	495.4793	329.8015	217.5192	228.3058	357.9348	543.9615	722.9108	874.2693	(97)
Space heating kWh	376.6475	282.5491	216.1517	89.5501	21.7771	0.0000	0.0000	0.0000	0.0000	113.2915	256.1804	385.2513	(98a)
Space heating requirement - total per year (kWh/year)												1741.3988	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	376.6475	282.5491	216.1517	89.5501	21.7771	0.0000	0.0000	0.0000	0.0000	113.2915	256.1804	385.2513	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1741.3988	
Space heating per m2											(98c) / (4) =	33.1885	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	529.0932	416.5202	426.8707	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9544	0.9807	0.9662	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	504.9894	408.4787	412.4565	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	723.5540	690.0457	625.2046	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	157.3665	209.4859	158.2846	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.3416	52.3715	39.5711	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												131.2842	(107)
Energy for space heating												33.1885	(99)
Energy for space cooling												2.5021	(108)
Total												35.6905	(109)
Fabric Energy Efficiency (TFEE)												35.7	(109)

Full SAP Calculation Printout

Plot Reference	P-45	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-45
Plot Address	Flat 12, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	79 C	**DER**	6.60	**TER**	14.68
Environmental	96 A	**% DER < TER**			55.04
CO_2 Emissions (t/year)	0.29	**DFEE**	36.18	**TFEE**	35.69
Compliance Check	See BREL	**% DFEE < TFEE**			-1.38
% DPER < TPER	13.05	**DPER**	68.00	**TPER**	78.20

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

			Area		Storey height		Volume
Main dwelling			(m2)		(m)		(m3)
Ground floor			52.4700	(1b) x	2.5500	(2b) =	133.7985 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)		52.4700					(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.8100 (17)
Infiltration rate			0.1405 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1194 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.1523	0.1493	0.1463	0.1314	0.1284	0.1135	0.1135	0.1105	0.1194	0.1284	0.1344	0.1403	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	44.6500	12.4900	32.1600	0.2100	6.7536	110.0000	3537.6002	(29a)
Communal Wall	30.0400	2.1500	27.8900	0.2000	5.5780	110.0000	3067.9001	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			80.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1795			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000	110.0000	1767.7000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15329.7702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	292.1626 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.6312 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.8107 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	(39)
Average = Sum(39)m / 12 =												55.8874	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	(40)
HLP (average)												1.0651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7629 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)		100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)											Total = Sum(45)m =	1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):		
Store volume		200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.6100 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
										Total per year (kWh/year) = Sum(64)m =		1992.4381	(64)
12Total per year (kWh/year)												1992	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	358.2381	366.1326	349.9525	335.5235	316.9621	303.9820	291.2929	292.4466	302.2694	314.2488	335.7378	350.3773	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains 50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)

Total gains	409.0607	466.7849	520.6096	594.8937	645.9354	646.0823	614.7651	562.5539	503.9121	434.8039	399.2844	392.0828	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	
alpha	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	
util living area	0.9963	0.9910	0.9746	0.9075	0.7513	0.5467	0.3991	0.4549	0.7237	0.9505	0.9914	0.9971	(86)
MIT	20.0391	20.2010	20.4463	20.7507	20.9370	20.9919	20.9990	20.9978	20.9617	20.6931	20.3037	19.9985	(87)
Th 2	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	(88)
util rest of house	0.9949	0.9877	0.9653	0.8771	0.6902	0.4671	0.3116	0.3601	0.6390	0.9269	0.9877	0.9960	(89)
MIT 2	18.9222	19.1277	19.4347	19.7944	19.9832	20.0256	20.0292	20.0288	20.0075	19.7387	19.2597	18.8706	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.4275	19.6133	19.8924	20.2271	20.4148	20.4628	20.4679	20.4672	20.4392	20.1705	19.7320	19.3809	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4275	19.6133	19.8924	20.2271	20.4148	20.4628	20.4679	20.4672	20.4392	20.1705	19.7320	19.3809	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9937	0.9859	0.9637	0.8840	0.7155	0.5031	0.3512	0.4031	0.6763	0.9310	0.9862	0.9951	(94)
Useful gains	406.4888	460.2101	501.7268	525.8782	462.1437	325.0310	215.9257	226.7573	340.8168	404.7862	393.7609	390.1427	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	845.4396	822.2895	748.4681	633.0436	487.0455	327.6553	216.1696	227.3067	354.2825	534.8714	705.9727	848.4233	(97)
Space heating kWh	326.5794	243.3173	183.5755	77.1591	18.5269	0.0000	0.0000	0.0000	0.0000	96.7834	224.7925	340.9607	(98a)
Space heating requirement - total per year (kWh/year)												1511.6948	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	326.5794	243.3173	183.5755	77.1591	18.5269	0.0000	0.0000	0.0000	0.0000	96.7834	224.7925	340.9607	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1511.6948	
Space heating per m2											(98c) / (4) =	28.8106	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	326.5794	243.3173	183.5755	77.1591	18.5269	0.0000	0.0000	0.0000	0.0000	96.7834	224.7925	340.9607	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	326.5794	243.3173	183.5755	77.1591	18.5269	0.0000	0.0000	0.0000	0.0000	96.7834	224.7925	340.9607	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1511.6948	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)

mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2286.9096	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1511.6948	0.1564	236.4124	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			323.0561	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			346.1387	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.6000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1511.6948	1.5790	2386.9239	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			3321.2724	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			3567.8890	(286)
Dwelling Primary energy Rate (DPER)			68.0000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3995	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)
Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			10.9600	1.1450	12.5496			(27)
Brickwork	44.6500	10.9600	33.6900	0.1800	6.0642			(29a)
Communal Wall	30.0400	2.1500	27.8900	0.1800	5.0202			(29a)
Lift Shaft Wall	6.0400		6.0400	0.1800	1.0872			(29a)
Total net area of external elements Aum(A, m2)			80.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.8712			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 292.1626 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0700	3.3509
E16 Corner (normal)	8.5500	0.0900	0.7695
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0500	0.9300
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.0200	0.0754
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0413 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.9125 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	58.1272	57.9665	57.8090	57.0692	56.9308	56.2865	56.2865	56.1672	56.5347	56.9308	57.2108	57.5035	(39)
Average = Sum(39)m / 12 =												57.0686	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1078	1.1048	1.1018	1.0877	1.0850	1.0727	1.0727	1.0705	1.0775	1.0850	1.0904	1.0959	(40)
HLP (average)												1.0876	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers												
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)
Hot water usage for baths												
23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)
Hot water usage for other uses												
32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m													
	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	220.3518	194.9791	207.2344	182.2321	176.7131	159.2853	157.1511	163.3000	165.0091	183.9559	195.5810	217.9316	(62)
WWHRS	-24.5851	-21.7433	-22.7683	-18.8531	-17.5704	-15.0351	-14.0930	-14.9865	-15.5559	-18.3387	-20.7755	-24.1298	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
										Total per year (kWh/year) = Sum(64)m =		1995.2899	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	95.0501	84.5056	90.6886	81.6726	80.5402	74.0428	74.0358	76.0804	75.9460	82.9484	86.1111	94.2454	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.7386	86.0677	77.7386	80.3299	77.7386	80.3299	77.7386	77.7386	80.3299	77.7386	80.3299	77.7386	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	127.7555	125.7524	121.8932	113.4342	108.2530	102.8372	99.5106	102.2586	105.4805	111.4898	119.5988	126.6739	(72)
Total internal gains													

	411.5827	419.5031	403.2971	388.8761	370.3067	354.3346	341.6375	342.7911	352.6221	367.5934	389.0905	403.7219 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2000	19.6403	0.6300	0.7000	0.7700	37.2144	(80)
Northwest	4.7600	11.2829	0.6300	0.7000	0.7700	16.4135	(81)

Solar gains	53.6279	106.2094	180.0844	273.7090	347.1708	361.0290	341.3682	285.0436	212.7849	127.2123	67.0544	44.0074	(83)
Total gains	465.2106	525.7125	583.3815	662.5851	717.4775	715.3637	683.0056	627.8347	565.4069	494.8056	456.1449	447.7293	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.2578	73.4609	73.6610	74.6159	74.7973	75.6535	75.6535	75.8142	75.3214	74.7973	74.4312	74.0523	
alpha	5.8839	5.8974	5.9107	5.9744	5.9865	6.0436	6.0436	6.0543	6.0214	5.9865	5.9621	5.9368	
util living area													
	0.9931	0.9849	0.9611	0.8737	0.7023	0.4996	0.3621	0.4104	0.6652	0.9215	0.9842	0.9944	(86)
MIT	20.0767	20.2455	20.4958	20.7967	20.9534	20.9948	20.9994	20.9987	20.9745	20.7520	20.3697	20.0529	(87)
Th 2	19.9945	19.9970	19.9994	20.0109	20.0131	20.0232	20.0232	20.0250	20.0193	20.0131	20.0087	20.0042	(88)
util rest of house													
	0.9906	0.9796	0.9478	0.8371	0.6400	0.4253	0.2820	0.3241	0.5813	0.8887	0.9776	0.9924	(89)
MIT 2	18.9431	19.1578	19.4691	19.8253	19.9801	20.0208	20.0230	20.0247	20.0053	19.7883	19.3254	18.9203	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.4560	19.6500	19.9337	20.2648	20.4205	20.4615	20.4648	20.4654	20.4438	20.2243	19.7979	19.4327	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4560	19.6500	19.9337	20.2648	20.4205	20.4615	20.4648	20.4654	20.4438	20.2243	19.7979	19.4327	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9888	0.9773	0.9468	0.8473	0.6665	0.4589	0.3183	0.3632	0.6187	0.8967	0.9758	0.9908	(94)
Useful gains	460.0196	513.7959	552.3223	561.4149	478.1992	328.2605	217.3867	228.0223	349.8261	443.6765	445.1260	443.6176	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	880.9733	855.0039	776.5859	648.5827	496.4643	329.9215	217.5340	228.3409	358.6471	547.9211	726.4547	875.9358	(97)
Space heating kWh													
	313.1895	229.2918	166.8522	62.7608	13.5893	0.0000	0.0000	0.0000	0.0000	77.5580	202.5567	321.6448	(98a)
Space heating requirement - total per year (kWh/year)												1387.4429	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	313.1895	229.2918	166.8522	62.7608	13.5893	0.0000	0.0000	0.0000	0.0000	77.5580	202.5567	321.6448	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1387.4429	
Space heating per m2											(98c) / (4) =	26.4426	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	313.1895	229.2918	166.8522	62.7608	13.5893	0.0000	0.0000	0.0000	0.0000	77.5580	202.5567	321.6448	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	339.3169	248.4201	180.7716	67.9965	14.7229	0.0000	0.0000	0.0000	0.0000	84.0281	219.4547	348.4775	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1079	84.6894	83.8354	82.1096	80.4414	79.8000	79.8000	79.8000	79.8000	82.4657	84.3911	85.1876	(217)
Fuel for water heating, kWh/month													
	230.0216	204.5544	220.0336	198.9769	197.8368	180.7647	179.2708	185.8566	187.2847	200.8316	207.1374	227.4998	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1525	12.9582	11.6674	8.5480	6.6027	5.3945	6.0232	7.8292	10.1694	13.3428	15.0707	16.6015	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1918	-21.0989	-31.9695	-37.9682	-42.7446	-40.5816	-40.1067	-36.9732	-31.7519	-25.0213	-15.9915	-12.1471	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0148	-10.7903	-21.8961	-33.5488	-45.0029	-45.4342	-44.8801	-37.6887	-27.2320	-15.6256	-6.7590	-3.9465	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1503.1884	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2420.0690	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3603	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-648.3653	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3491.2524	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1503.1884	0.2100	315.6696	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2420.0690	0.2100	508.2145	(264)
Space and water heating			823.8841	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3603	0.1443	18.8150	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5464	0.1335	-46.7861	
PV Unit electricity exported	-297.8189	0.1253	-37.3248	
Total			-84.1110	(269)
Total CO2, kg/year			770.5174	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1503.1884	1.1300	1698.6029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2420.0690	1.1300	2734.6780	(278)
Space and water heating			4433.2809	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.3603	1.5338	199.9509	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5464	1.4932	-523.4376	
PV Unit electricity exported	-297.8189	0.4600	-137.0000	
Total			-660.4376	(283)
Total Primary energy kWh/year			4102.8950	(286)
Target Primary Energy Rate (TPER)			78.2000	(287)

Full SAP Calculation Printout

Plot Reference	P-45	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-45
Plot Address	Flat 12, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	79 C	**DER**	6.60	**TER**	14.68
Environmental	96 A	**% DER < TER**			55.04
CO_2 Emissions (t/year)	0.29	**DFEE**	36.18	**TFEE**	35.69
Compliance Check	See BREL	**% DFEE < TFEE**			-1.38
% DPER < TPER	13.05	**DPER**	68.00	**TPER**	78.20

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	133.7985	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8100 (17)
Infiltration rate		0.1405 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1194 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1523	0.1493	0.1463	0.1314	0.1284	0.1135	0.1135	0.1105	0.1194	0.1284	0.1344	0.1403	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	44.6500	12.4900	32.1600	0.2100	6.7536	110.0000	3537.6002	(29a)
Communal Wall	30.0400	2.1500	27.8900	0.2000	5.5780	110.0000	3067.9001	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			80.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1795			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000	110.0000	1767.7000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15329.7702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		292.1626 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.6312 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.8107 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	(39)
Average = Sum(39)m / 12 =												55.8874	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	(40)
HLP (average)												1.0651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)											Total = Sum(45)m =	1675.1071	

Distribution loss (46)m = 0.15 x (45)m

26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
									Total per year (kWh/year) = Sum(64)m =		1992.4381	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)
Total gains	458.4159	506.6073	563.7674	628.0933	673.9123	665.3305	633.7584	582.7767	526.5195	467.3695	437.0728	438.5997	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	
alpha	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	
util living area	0.9932	0.9865	0.9637	0.8884	0.7280	0.5318	0.3873	0.4394	0.6992	0.9338	0.9865	0.9948	(86)
MIT	20.1264	20.2689	20.5119	20.7839	20.9467	20.9930	20.9991	20.9982	20.9681	20.7354	20.3683	20.0814	(87)
Th 2	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	(88)
util rest of house	0.9908	0.9817	0.9512	0.8545	0.6665	0.4540	0.3023	0.3477	0.6149	0.9048	0.9809	0.9929	(89)
MIT 2	19.0330	19.2128	19.5138	19.8294	19.9910	20.0261	20.0292	20.0289	20.0115	19.7852	19.3402	18.9760	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.5277	19.6906	19.9654	20.2613	20.4234	20.4636	20.4680	20.4675	20.4443	20.2151	19.8054	19.4761	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5277	19.6906	19.9654	20.2613	20.4234	20.4636	20.4680	20.4675	20.4443	20.2151	19.8054	19.4761	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9891	0.9796	0.9502	0.8634	0.6923	0.4891	0.3408	0.3893	0.6523	0.9112	0.9792	0.9914	(94)
Useful gains	453.4357	496.2890	535.7047	542.2766	466.5756	325.4410	215.9688	226.8658	343.4236	425.8506	427.9867	434.8477	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	851.0361	826.6111	752.5457	634.9531	487.5298	327.7001	216.1748	227.3195	354.5664	537.3645	710.0700	853.7446	(97)
Space heating kWh	295.8147	221.9765	161.3297	66.7270	15.5900	0.0000	0.0000	0.0000	0.0000	82.9663	203.0999	311.6593	(98a)
Space heating requirement - total per year (kWh/year)												1359.1635	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.8147	221.9765	161.3297	66.7270	15.5900	0.0000	0.0000	0.0000	82.9663	203.0999	311.6593	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1359.1635	
Space heating per m2										(98c) / (4) =		25.9036	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	295.8147	221.9765	161.3297	66.7270	15.5900	0.0000	0.0000	0.0000	0.0000	82.9663	203.0999	311.6593	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	295.8147	221.9765	161.3297	66.7270	15.5900	0.0000	0.0000	0.0000	0.0000	82.9663	203.0999	311.6593	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	1359.1635	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	613.9647	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 33.9527 (230a)
Total electricity for the above, kWh/year 33.9527 (231)
Electricity for lighting (calculated in Appendix L) 127.2974 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2134.3783 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1359.1635	16.4900	224.1261	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	16.4900	101.2428	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	16.4900	5.5988	(249)
Energy for lighting	127.2974	16.4900	20.9913	(250)
Additional standing charges			0.0000	(251)
Total energy cost			351.9590	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.2999 (257)
SAP value 78.9280
SAP rating (Section 12) 79 (258)
SAP band C

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1359.1635	0.1565	212.7693	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			299.4130	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			322.4956	(272)
CO2 emissions per m2			6.1500	(273)
EI value			95.5664	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b) x	2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8100	(17)
Infiltration rate		0.1405	(18)
Number of sides sheltered		2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1194 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1284	0.1224	0.1224	0.1135	0.1164	0.1015	0.1015	0.0985	0.1015	0.1135	0.1105	0.1194	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	44.6500	12.4900	32.1600	0.2100	6.7536	110.0000	3537.6002	(29a)
Communal Wall	30.0400	2.1500	27.8900	0.2000	5.5780	110.0000	3067.9001	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			80.7300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.1795			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000	110.0000	1767.7000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15329.7702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 292.1626 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.6312 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.8107 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	(39)
Average = Sum(39)m / 12 =												55.8874	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	(40)
HLP (average)												1.0651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)
Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	

Distribution loss (46)m = 0.15 x (45)m

26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
									Total per year (kWh/year) = Sum(64)m =		1992.4381	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

	57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)

Water heating gains (Table 5)

	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)

Total internal gains

	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(81)
West	7.0700	23.8018	0.3300	0.0000	0.7700	42.7596	(80)

Solar gains	61.7383	107.0049	180.1846	277.6073	342.3516	376.1742	352.3549	302.2168	226.8606	137.6114	76.0861	50.9254	(83)
Total gains	469.3315	512.9598	573.2949	646.3303	687.2905	699.4044	662.6410	614.8861	551.7374	484.4258	449.6123	447.8196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	
alpha	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	
util living area													
	0.9902	0.9816	0.9488	0.8405	0.6399	0.4143	0.2782	0.3089	0.5959	0.8949	0.9787	0.9922	(86)
MIT	20.2253	20.3575	20.6050	20.8591	20.9765	20.9985	20.9999	20.9998	20.9880	20.8220	20.4764	20.1881	(87)
Th 2	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	(88)
util rest of house													
	0.9865	0.9750	0.9312	0.7961	0.5707	0.3377	0.1965	0.2208	0.5053	0.8517	0.9695	0.9893	(89)
MIT 2	19.1585	19.3242	19.6261	19.9085	20.0148	20.0289	20.0294	20.0294	20.0240	19.8791	19.4751	19.1117	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.6412	19.7917	20.0690	20.3386	20.4499	20.4676	20.4685	20.4685	20.4602	20.3057	19.9281	19.5987	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6412	19.7917	20.0690	20.3386	20.4499	20.4676	20.4685	20.4685	20.4602	20.3057	19.9281	19.5987	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9730	0.9320	0.8112	0.6013	0.3724	0.2335	0.2607	0.5462	0.8654	0.9684	0.9877	(94)
Useful gains	462.1419	499.0955	534.3183	524.3124	413.2819	260.4529	154.7073	160.2770	301.3736	419.2373	435.3847	442.2915	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	812.6692	787.5495	708.0379	583.3858	421.9458	260.8604	154.7244	160.3105	305.1547	492.1290	666.6313	810.2950	(97)
Space heating kWh	260.7924	193.8411	129.2474	42.5328	6.4460	0.0000	0.0000	0.0000	0.0000	54.2314	166.4976	273.7946	(98a)
Space heating requirement - total per year (kWh/year)												1127.3832	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	260.7924	193.8411	129.2474	42.5328	6.4460	0.0000	0.0000	0.0000	0.0000	54.2314	166.4976	273.7946	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1127.3832	
Space heating per m2											(98c) / (4) =	21.4862	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	260.7924	193.8411	129.2474	42.5328	6.4460	0.0000	0.0000	0.0000	0.0000	54.2314	166.4976	273.7946	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	260.7924	193.8411	129.2474	42.5328	6.4460	0.0000	0.0000	0.0000	0.0000	54.2314	166.4976	273.7946	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
200.7083 177.2366 187.5909 163.2223 157.0696 140.2755 137.5076 143.6565 145.9993 164.3124 176.5711 198.2881 (64)
Efficiency of water heater 324.5200 (216)
(217)m 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 (217)
Fuel for water heating, kWh/month
61.8477 54.6150 57.8057 50.2965 48.4006 43.2255 42.3726 44.2674 44.9893 50.6324 54.4099 61.1020 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 2.8837 2.6046 2.8837 2.7906 2.8837 2.7906 2.8837 2.8837 2.7906 2.8837 2.7906 2.8837 (231)
Lighting 15.7730 12.6537 11.3933 8.3472 6.4476 5.2678 5.8817 7.6453 9.9305 13.0293 14.7166 16.2114 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 1127.3832 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 613.9647 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 33.9527 (230a)
Total electricity for the above, kWh/year 33.9527 (231)
Electricity for lighting (calculated in Appendix L) 127.2974 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 1902.5979 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1127.3832	27.6700	311.9469	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	27.6700	169.8840	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	27.6700	9.3947	(249)
Energy for lighting	127.2974	27.6700	35.2232	(250)
Additional standing charges			0.0000	(251)
Total energy cost			526.4488	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1127.3832	0.1573	177.3768	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			264.0205	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			287.1031	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1127.3832	1.5825	1784.0322	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			2718.3807	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			2964.9973	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 79
Current environmental impact rating: A 96

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 79
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£526	£526	£0
Space heating	£321	£321	£0
Water heating	£170	£170	£0
Lighting	£35	£35	£0
Total cost of fuels	£526	£526	£0
Total cost of uses	£526	£526	£0
Delivered energy	36 kWh/m²	36 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b)	= 133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume					= 133.7985	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8100	(17)
Infiltration rate		0.1405	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1194	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1523	0.1493	0.1463	0.1314	0.1284	0.1135	0.1135	0.1105	0.1194	0.1284	0.1344	0.1403	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation: 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a): 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	44.6500	12.4900	32.1600	0.2100	6.7536	110.0000	3537.6002	(29a)
Communal Wall	30.0400	2.1500	27.8900	0.2000	5.5780	110.0000	3067.9001	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			80.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1795			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000	110.0000	1767.7000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15329.7702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		292.1626 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.6312 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.8107 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	(39)
Average = Sum(39)m / 12 =												55.8874	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	(40)
HLP (average)												1.0651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7629 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)		100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	

Distribution loss (46)m = 0.15 x (45)m

26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):		
Store volume		200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.6100 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
								Total per year (kWh/year) = Sum(64)m =			1992.4381	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)

Total internal gains

	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054 (83)
Total gains	458.4159	506.6073	563.7674	628.0933	673.9123	665.3305	633.7584	582.7767	526.5195	467.3695	437.0728	438.5997 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	
alpha	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	
util living area	0.9932	0.9865	0.9637	0.8884	0.7280	0.5318	0.3873	0.4394	0.6992	0.9338	0.9865	0.9948	(86)
MIT	20.1264	20.2689	20.5119	20.7839	20.9467	20.9930	20.9991	20.9982	20.9681	20.7354	20.3683	20.0814	(87)
Th 2	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	(88)
util rest of house	0.9908	0.9817	0.9512	0.8545	0.6665	0.4540	0.3023	0.3477	0.6149	0.9048	0.9809	0.9929	(89)
MIT 2	19.0330	19.2128	19.5138	19.8294	19.9910	20.0261	20.0292	20.0289	20.0115	19.7852	19.3402	18.9760	(90)
Living area fraction										fLA = Living area / (4) =		0.4524	(91)
MIT	19.5277	19.6906	19.9654	20.2613	20.4234	20.4636	20.4680	20.4675	20.4443	20.2151	19.8054	19.4761	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5277	19.6906	19.9654	20.2613	20.4234	20.4636	20.4680	20.4675	20.4443	20.2151	19.8054	19.4761	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9891	0.9796	0.9502	0.8634	0.6923	0.4891	0.3408	0.3893	0.6523	0.9112	0.9792	0.9914	(94)
Useful gains	453.4357	496.2890	535.7047	542.2766	466.5756	325.4410	215.9688	226.8658	343.4236	425.8506	427.9867	434.8477	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	851.0361	826.6111	752.5457	634.9531	487.5298	327.7001	216.1748	227.3195	354.5664	537.3645	710.0700	853.7446	(97)
Space heating kWh	295.8147	221.9765	161.3297	66.7270	15.5900	0.0000	0.0000	0.0000	0.0000	82.9663	203.0999	311.6593	(98a)
Space heating requirement - total per year (kWh/year)												1359.1635	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.8147	221.9765	161.3297	66.7270	15.5900	0.0000	0.0000	0.0000	0.0000	82.9663	203.0999	311.6593	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1359.1635	
Space heating per m2										(98c) / (4) =		25.9036	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	295.8147	221.9765	161.3297	66.7270	15.5900	0.0000	0.0000	0.0000	0.0000	82.9663	203.0999	311.6593	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	295.8147	221.9765	161.3297	66.7270	15.5900	0.0000	0.0000	0.0000	0.0000	82.9663	203.0999	311.6593	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1359.1635	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	613.9647	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2134.3783	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1359.1635	16.4900	224.1261	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	16.4900	101.2428	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	16.4900	5.5988	(249)
Energy for lighting	127.2974	16.4900	20.9913	(250)
Additional standing charges			0.0000	(251)
Total energy cost			351.9590	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2999	(257)
SAP value		78.9280	
SAP rating (Section 12)		79	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1359.1635	0.1565	212.7693	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			299.4130	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			322.4956	(272)
CO2 emissions per m2			6.1500	(273)
EI value			95.5664	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8100	(17)
Infiltration rate		0.1405	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1194	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1284	0.1224	0.1224	0.1135	0.1164	0.1015	0.1015	0.0985	0.1015	0.1135	0.1105	0.1194	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	44.6500	12.4900	32.1600	0.2100	6.7536	110.0000	3537.6002	(29a)
Communal Wall	30.0400	2.1500	27.8900	0.2000	5.5780	110.0000	3067.9001	(29a)
Lift Shaft Wall	6.0400		6.0400	0.1600	0.9664	110.0000	664.4000	(29a)
Total net area of external elements Aum(A, m2)			80.7300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1795			(33)
Main dwelling								
Party Wall 1			16.0700	0.0000	0.0000	110.0000	1767.7000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Party Ceiling 1			52.4700			30.0000	1574.1000	(32b)
Internal Wall 1			116.1300			9.0000	1045.1700	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15329.7702	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	292.1626	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	47.8700	0.0380	1.8191
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.2000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		3.6312 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.8107 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	55.8874	(39)
Average = Sum(39)m / 12 =												55.8874	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	1.0651	(40)
HLP (average)												1.0651	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7629	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)
Hot water usage for baths	23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)
Hot water usage for other uses	32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)
Average daily hot water use (litres/day)												100.8506	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)

If cylinder contains dedicated solar storage

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881 (64)

Total per year (kWh/year) = Sum(64)m = 1992.4381 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)

Water heating gains (Table 5)

	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)

Total internal gains

	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(81)
West	7.0700	23.8018	0.3300	0.0000	0.7700	42.7596	(80)

Solar gains	61.7383	107.0049	180.1846	277.6073	342.3516	376.1742	352.3549	302.2168	226.8606	137.6114	76.0861	50.9254	(83)
Total gains	469.3315	512.9598	573.2949	646.3303	687.2905	699.4044	662.6410	614.8861	551.7374	484.4258	449.6123	447.8196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	76.1937	
alpha	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	6.0796	
util living area	0.9902	0.9816	0.9488	0.8405	0.6399	0.4143	0.2782	0.3089	0.5959	0.8949	0.9787	0.9922	(86)
MIT	20.2253	20.3575	20.6050	20.8591	20.9765	20.9985	20.9999	20.9998	20.9880	20.8220	20.4764	20.1881	(87)
Th 2	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	20.0294	(88)
util rest of house	0.9865	0.9750	0.9312	0.7961	0.5707	0.3377	0.1965	0.2208	0.5053	0.8517	0.9695	0.9893	(89)
MIT 2	19.1585	19.3242	19.6261	19.9085	20.0148	20.0289	20.0294	20.0294	20.0240	19.8791	19.4751	19.1117	(90)

Living area fraction fLA = Living area / (4) = 0.4524 (91)

MIT	19.6412	19.7917	20.0690	20.3386	20.4499	20.4676	20.4685	20.4685	20.4602	20.3057	19.9281	19.5987	(92)

Temperature adjustment 0.0000

adjusted MIT	19.6412	19.7917	20.0690	20.3386	20.4499	20.4676	20.4685	20.4685	20.4602	20.3057	19.9281	19.5987	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9730	0.9320	0.8112	0.6013	0.3724	0.2335	0.2607	0.5462	0.8654	0.9684	0.9877	(94)
Useful gains	462.1419	499.0955	534.3183	524.3124	413.2819	260.4529	154.7073	160.2770	301.3736	419.2373	435.3847	442.2915	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	812.6692	787.5495	708.0379	583.3858	421.9458	260.8604	154.7244	160.3105	305.1547	492.1290	666.6313	810.2950	(97)
Space heating kWh	260.7924	193.8411	129.2474	42.5328	6.4460	0.0000	0.0000	0.0000	0.0000	54.2314	166.4976	273.7946	(98a)

Space heating requirement - total per year (kWh/year) 1127.3832

Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh	260.7924	193.8411	129.2474	42.5328	6.4460	0.0000	0.0000	0.0000	0.0000	54.2314	166.4976	273.7946	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1127.3832

Space heating per m2 (98c) / (4) = 21.4862 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	260.7924	193.8411	129.2474	42.5328	6.4460	0.0000	0.0000	0.0000	0.0000	54.2314	166.4976	273.7946	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	260.7924	193.8411	129.2474	42.5328	6.4460	0.0000	0.0000	0.0000	0.0000	54.2314	166.4976	273.7946	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1127.3832	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	613.9647	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1902.5979	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1127.3832	27.6700	311.9469	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	27.6700	169.8840	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	27.6700	9.3947	(249)
Energy for lighting	127.2974	27.6700	35.2232	(250)
Additional standing charges			0.0000	(251)
Total energy cost			526.4488	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1127.3832	0.1573	177.3768	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			264.0205	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			287.1031	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1127.3832	1.5825	1784.0322	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			2718.3807	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			2964.9973	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-46	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-46
Plot Address	Flat 19, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	70 C	**DER**	8.01	**TER**	16.91
Environmental	94 A	**% DER < TER**			52.63
CO_2 Emissions (t/year)	0.51	**DFEE**	47.11	**TFEE**	53.66
Compliance Check	See BREL	**% DFEE < TFEE**			12.20
% DPER < TPER	8.38	**DPER**	82.32	**TPER**	89.85

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	238.70	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	32.72 m	74.70 m²	2.55 m

8.0 Living Area	25.11	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	64.97	47.03	0.00	None	17.94	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	16.05	13.90	0.70	Stairwell Access Corridor 3	2.15	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	12.26	12.26	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	21.35	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	169.87

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
ColdRoof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	74.70	74.70	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	74.70

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.15	
Patio Door	Patio Door	Brickwork	North West	5.42	
NE	Window	Brickwork	North West	9.79	
NE	Window	Brickwork	North East	2.72	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	27.50	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	14.26	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.70	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	2.85	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	7.49	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	28.20	0.02	0.02	RCD	Yes
E15 Flat roof with parapet	Table K1 - Default	32.72	0.30	0.30		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	7.49	0.10	0.10	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	5.27	0.33	0.33	AbbeyCalculated	No

Y-value	0.09	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.88	m³/(h.m²) @ 50 Pa
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	8
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	
28.0 Water Heating		
Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
ENSUITE	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

Summary for Input Data

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-46	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-46
Plot Address	Flat 19, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	70 C	**DER**	8.01	**TER**	16.91
Environmental	94 A	**% DER < TER**			52.63
CO_2 Emissions (t/year)	0.51	**DFEE**	47.11	**TFEE**	53.66
Compliance Check	See BREL	**% DFEE < TFEE**			12.20
% DPER < TPER	8.38	**DPER**	82.32	**TPER**	89.85

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8800 (17)
Infiltration rate		0.1440 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	64.9700	17.9300	47.0400	0.2100	9.8784	110.0000	5174.4001	(29a)
Communal Wall	16.0500	2.1500	13.9000	0.2100	2.9190	110.0000	1528.9999	(29a)
Lift Shaft Wall	12.2600		12.2600	0.1600	1.9616	110.0000	1348.6000	(29a)
ColdRoof	74.7000		74.7000	0.0900	6.7230	9.0000	672.3000	(30)
Total net area of external elements Aum(A, m2)			167.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.5925			(33)
Main dwelling								
Party Wall 1			21.3500	0.0000	0.0000	110.0000	2348.5000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17830.6301 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		238.6965 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	27.5000	0.0380	1.0450
E16	Corner (normal)	14.2600	0.0540	0.7700
E17	Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18	Party wall between dwellings	2.8500	0.0380	0.1083
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2	Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4	Jamb	28.2000	0.0160	0.4512
E15	Flat roof with parapet	32.7200	0.3000	9.8160
P4	Party wall - Roof (insulation at ceiling level)	7.4900	0.1010	0.7565
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.5582 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.1508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	(39)

Average = Sum(39)m / 12 = 90.5808

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	(40)
HLP (average)												1.2126	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)

Energy content (annual) Total = Sum(45)m = 1984.2299

Distribution loss (46)m = 0.15 x (45)m

30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)

Total per year (kWh/year) = Sum(64)m = 2301.5609 (64)

12Total per year (kWh/year) 2302 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9168	116.1579	104.9168	108.4140	104.9168	108.4140	104.9168	104.9168	108.4140	104.9168	108.4140	104.9168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains	463.2294	474.2558	453.0037	434.9013	410.6494	393.9932	377.3778	378.4747	391.2280	406.4287	434.1485	452.7703	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	51.4052	104.6368	188.5223	309.6077	416.1736	443.6851	415.0583	330.8893	229.7173	127.8745	64.6811	41.9801	(83)
Total gains	514.6346	578.8926	641.5260	744.5090	826.8229	837.6783	792.4361	709.3640	620.9453	534.3032	498.8296	494.7504	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	
alpha	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	
util living area	0.9956	0.9917	0.9813	0.9400	0.8305	0.6480	0.4925	0.5659	0.8255	0.9676	0.9918	0.9963	(86)
MIT	19.5287	19.6994	19.9941	20.4173	20.7709	20.9457	20.9878	20.9775	20.8347	20.3748	19.8758	19.4868	(87)
Th 2	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	(88)
util rest of house	0.9942	0.9890	0.9750	0.9193	0.7767	0.5548	0.3758	0.4422	0.7488	0.9524	0.9886	0.9952	(89)
MIT 2	18.2069	18.4245	18.7979	19.3195	19.7184	19.8792	19.9061	19.9019	19.7942	19.2787	18.6507	18.1535	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	18.6512	18.8530	19.2000	19.6885	20.0722	20.2377	20.2697	20.2635	20.1440	19.6472	19.0625	18.6016	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6512	18.8530	19.2000	19.6885	20.0722	20.2377	20.2697	20.2635	20.1440	19.6472	19.0625	18.6016	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9918	0.9854	0.9695	0.9142	0.7855	0.5842	0.4151	0.4838	0.7674	0.9476	0.9851	0.9931	(94)
Useful gains	510.4123	570.4469	621.9754	680.6401	649.5068	489.3591	328.9669	343.1727	476.5414	506.3051	491.4080	491.3373	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1299.9447	1263.8758	1150.3781	977.2318	758.3570	510.6691	332.4028	349.9554	547.4685	819.5015	1083.5737	1304.5120	(97)
Space heating kWh	587.4120	465.9842	393.1316	213.5460	80.9846	0.0000	0.0000	0.0000	0.0000	233.0181	426.3593	605.0020	(98a)
Space heating requirement - total per year (kWh/year)												3005.4378	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	587.4120	465.9842	393.1316	213.5460	80.9846	0.0000	0.0000	0.0000	0.0000	233.0181	426.3593	605.0020	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3005.4378	
Space heating per m2											(98c) / (4) =	40.2334	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	587.4120	465.9842	393.1316	213.5460	80.9846	0.0000	0.0000	0.0000	0.0000	233.0181	426.3593	605.0020	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	587.4120	465.9842	393.1316	213.5460	80.9846	0.0000	0.0000	0.0000	0.0000	233.0181	426.3593	605.0020	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3005.4378	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	709.2200	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3935.3348	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3005.4378	0.1552	466.3678	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			566.4977	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			598.0766	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.0100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3005.4378	1.5745	4732.0769	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			5811.5506	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			6149.0157	(286)
Dwelling Primary energy Rate (DPER)			82.3200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1575	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4075	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3464	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3723	0.3291	0.3291	0.3204	0.3464	0.3723	0.3897	0.4070	(22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			16.5300	1.1450	18.9275			(27)
Brickwork	64.9700	16.5300	48.4400	0.1800	8.7192			(29a)
Communal Wall	16.0500	2.1500	13.9000	0.1800	2.5020			(29a)
Lift Shaft Wall	12.2600		12.2600	0.1800	2.2068			(29a)
ColdRoof	74.7000		74.7000	0.1100	8.2170			(30)
Total net area of external elements Aum(A, m2)			167.9800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7225			(33)
Main dwelling								
Party Wall 1			21.3500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 238.6965 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	27.5000	0.0700	1.9250
E16 Corner (normal)	14.2600	0.0900	1.2834
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0500	1.4100
E15 Flat roof with parapet	32.7200	0.5600	18.3232
P4 Party wall - Roof (insulation at ceiling level)	7.4900	0.1200	0.8988
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.0200	0.1054

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 24.0288 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.7513 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.5598	37.3217	37.0884	35.9926	35.7875	34.8331	34.8331	34.6563	35.2007	35.7875	36.2023	36.6359	(38)
Heat transfer coeff	104.3111	104.0730	103.8397	102.7439	102.5388	101.5844	101.5844	101.4076	101.9520	102.5388	102.9536	103.3872	(39)
Average = Sum(39)m / 12 =												102.7429	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3964	1.3932	1.3901	1.3754	1.3727	1.3599	1.3599	1.3575	1.3648	1.3727	1.3782	1.3840	(40)
HLP (average)												1.3754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	252.4175	223.1938	236.8779	207.5392	200.7241	180.3575	177.5526	184.8368	187.1391	209.3051	223.3528	249.5509	(62)
WWHRS	-29.1205	-25.7544	-26.9686	-22.3310	-20.8117	-17.8087	-16.6928	-17.7512	-18.4256	-21.7218	-24.6081	-28.5813	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
										Total per year (kWh/year) = Sum(64)m =		2262.2716	(64)
12Total per year (kWh/year)												2262	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	105.7120	93.8870	100.5450	90.0872	88.5239	81.0493	80.8194	83.2414	83.3042	91.3771	95.3452	104.7588	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9351	116.1781	104.9351	108.4329	104.9351	108.4329	104.9351	104.9351	108.4329	104.9351	108.4329	104.9351	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	142.0860	139.7128	135.1411	125.1212	118.9837	112.5685	108.6282	111.8835	115.7003	122.8186	132.4240	140.8048	(72)
Total internal gains	516.3497	527.3781	506.1240	488.0222	463.7697	444.1142	427.4981	428.5950	441.3489	459.5491	487.2695	505.8906	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.5100	11.2829	0.6300	0.7000	0.7700	8.6550	(75)
Northwest	14.0200	11.2829	0.6300	0.7000	0.7700	48.3440	(81)

Solar gains	56.9990	116.0231	209.0366	343.2982	461.4601	491.9654	460.2235	366.8955	254.7144	141.7894	71.7195	46.5482	(83)
Total gains	573.3487	643.4011	715.1607	831.3204	925.2299	936.0795	887.7216	795.4905	696.0633	601.3384	558.9889	552.4388	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.4825	47.5911	47.6981	48.2068	48.3032	48.7570	48.7570	48.8420	48.5812	48.3032	48.1086	47.9068	
alpha	4.1655	4.1727	4.1799	4.2138	4.2202	4.2505	4.2505	4.2561	4.2387	4.2202	4.2072	4.1938	
util living area	0.9934	0.9886	0.9761	0.9307	0.8204	0.6417	0.4896	0.5598	0.8134	0.9591	0.9882	0.9944	(86)
MIT	19.3328	19.5209	19.8503	20.3298	20.7222	20.9292	20.9823	20.9697	20.8036	20.3007	19.7464	19.3075	(87)
Th 2	19.7661	19.7685	19.7709	19.7822	19.7843	19.7942	19.7942	19.7960	19.7904	19.7843	19.7801	19.7756	(88)
util rest of house	0.9913	0.9848	0.9679	0.9065	0.7616	0.5411	0.3623	0.4259	0.7292	0.9398	0.9837	0.9926	(89)
MIT 2	17.8594	18.1002	18.5180	19.1146	19.5566	19.7553	19.7889	19.7857	19.6572	19.0941	18.3968	17.8334	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	18.3546	18.5777	18.9659	19.5231	19.9484	20.1499	20.1901	20.1837	20.0426	19.4997	18.8504	18.3289	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3546	18.5777	18.9659	19.5231	19.9484	20.1499	20.1901	20.1837	20.0426	19.4997	18.8504	18.3289	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9877	0.9797	0.9607	0.9002	0.7705	0.5724	0.4053	0.4709	0.7492	0.9338	0.9787	0.9894	(94)
Useful gains	566.3020	630.3570	687.0606	748.3404	712.8973	535.8477	359.7525	374.5803	521.4812	561.5547	547.0946	546.5810	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1466.0550	1423.4844	1294.4512	1091.4563	845.7806	563.7830	364.6970	383.6974	605.8552	912.5650	1209.7505	1460.7487	(97)
Space heating kWh	669.4162	532.9816	451.8987	247.0434	98.8652	0.0000	0.0000	0.0000	0.0000	261.1516	477.1123	680.1407	(98a)
Space heating requirement - total per year (kWh/year)												3418.6098	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	669.4162	532.9816	451.8987	247.0434	98.8652	0.0000	0.0000	0.0000	0.0000	261.1516	477.1123	680.1407	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3418.6098	
Space heating per m2											(98c) / (4) =	45.7645	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	669.4162	532.9816	451.8987	247.0434	98.8652	0.0000	0.0000	0.0000	0.0000	261.1516	477.1123	680.1407	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	725.2614	577.4449	489.5977	267.6527	107.1129	0.0000	0.0000	0.0000	0.0000	282.9378	516.9147	736.8805	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3636	86.1729	85.7332	84.7066	82.7752	79.8000	79.8000	79.8000	79.8000	84.8019	85.9495	86.4102	(217)
Fuel for water heating, kWh/month	258.5544	229.1199	244.8402	218.6466	217.3506	203.6952	201.5786	209.3805	211.4205	221.2017	231.2343	255.7216	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.8034	17.4915	15.7492	11.5385	8.9127	7.2817	8.1305	10.5683	13.7271	18.0107	20.3431	22.4094	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.9677	-29.5587	-44.5886	-52.6946	-59.0696	-55.9572	-55.2711	-51.0588	-44.0275	-34.9131	-22.4456	-17.1028	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.3761	-15.8411	-32.0982	-49.1221	-65.8539	-66.5010	-65.7221	-55.2352	-39.9462	-22.9546	-9.9435	-5.8092	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3703.8026	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2702.7442	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.9662	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-923.0586	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5745.4544	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3703.8026	0.2100	777.7985	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2702.7442	0.2100	567.5763	(264)
Space and water heating			1345.3748	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.9662	0.1443	25.3974	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6552	0.1336	-65.0038	
PV Unit electricity exported	-436.4034	0.1253	-54.7027	
Total			-119.7065	(269)
Total CO2, kg/year			1262.9950	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3703.8026	1.1300	4185.2969	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2702.7442	1.1300	3054.1010	(278)
Space and water heating			7239.3979	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.9662	1.5338	269.9029	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6552	1.4936	-726.8702	
PV Unit electricity exported	-436.4034	0.4601	-200.7849	
Total			-927.6551	(283)
Total Primary energy kWh/year			6711.7464	(286)
Target Primary Energy Rate (TPER)			89.8500	(287)

Full SAP Calculation Printout

Plot Reference	P-46	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-46
Plot Address	Flat 19, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	70 C	**DER**	8.01	**TER**	16.91
Environmental	94 A	**% DER < TER**			52.63
CO_2 Emissions (t/year)	0.51	**DFEE**	47.11	**TFEE**	53.66
Compliance Check	See BREL	**% DFEE < TFEE**			12.20
% DPER < TPER	8.38	**DPER**	82.32	**TPER**	89.85

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1575 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.8800 (17)
Infiltration rate			0.3015 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2563 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3267	0.3203	0.3139	0.2819	0.2755	0.2435	0.2435	0.2370	0.2563	0.2755	0.2883	0.3011	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5534	0.5513	0.5493	0.5397	0.5379	0.5296	0.5296	0.5281	0.5328	0.5379	0.5416	0.5453	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	64.9700	17.9300	47.0400	0.2100	9.8784	110.0000	5174.4001	(29a)
Communal Wall	16.0500	2.1500	13.9000	0.2100	2.9190	110.0000	1528.9999	(29a)
Lift Shaft Wall	12.2600		12.2600	0.1600	1.9616	110.0000	1348.6000	(29a)
ColdRoof	74.7000		74.7000	0.0900	6.7230	9.0000	672.3000	(30)
Total net area of external elements Aum(A, m2)			167.9800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.5925			(33)
Main dwelling								
Party Wall 1			21.3500	0.0000	0.0000	110.0000	2348.5000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	17830.6301 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	238.6965 (35)
List of Thermal Bridges	

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	27.5000	0.0380	1.0450
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E15 Flat roof with parapet	32.7200	0.3000	9.8160
P4 Party wall - Roof (insulation at ceiling level)	7.4900	0.1010	0.7565
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.5582 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.1508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.7855	34.6552	34.5275	33.9276	33.8154	33.2929	33.2929	33.1961	33.4941	33.8154	34.0424	34.2798	(38)
Heat transfer coeff	93.9363	93.8060	93.6783	93.0784	92.9661	92.4437	92.4437	92.3469	92.6449	92.9661	93.1932	93.4306	(39)
Average = Sum(39)m / 12 =												93.0778	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2575	1.2558	1.2541	1.2460	1.2445	1.2375	1.2375	1.2362	1.2402	1.2445	1.2476	1.2507	(40)
HLP (average)												1.2460	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 60.7331 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	66.2596	64.4421	62.4578	59.9878	57.7845	55.4946	55.0188	56.9991	59.0301	61.3817	63.8734	66.1666	(44)
Energy conte	104.9390	91.7647	95.9952	82.1204	77.7890	68.2371	66.5404	70.5768	72.7901	83.2943	90.9994	103.6009	(45)
Energy content (annual)										Total = Sum(45)m =		1008.6473	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(64)
										Total per year (kWh/year) = Sum(64)m =		857.3502	(64)
12Total per year (kWh/year)												857	(64)
Electric shower(s)	51.0123	45.4524	49.6322	47.3634	48.2522	46.0279	47.5622	48.2522	47.3634	49.6322	48.6990	51.0123	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		580.2617	(64a)
Heat gains from water heating, kWh/month	35.0526	30.8631	32.8070	29.2914	28.5932	26.0074	26.0304	27.0606	27.3087	30.1081	31.5121	34.7683	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9168	116.1579	104.9168	108.4140	104.9168	108.4140	104.9168	104.9168	108.4140	104.9168	108.4140	104.9168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	47.1137	45.9272	44.0955	40.6825	38.4317	36.1213	34.9871	36.3718	37.9288	40.4679	43.7668	46.7315	(72)
Total internal gains	418.3592	430.5722	412.0601	400.5647	380.1995	367.6482	353.8388	353.0650	363.5585	374.1800	395.5934	408.7991	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	51.4052	104.6368	188.5223	309.6077	416.1736	443.6851	415.0583	330.8893	229.7173	127.8745	64.6811	41.9801	(83)
Total gains	469.7644	535.2091	600.5824	710.1725	796.3730	811.3332	768.8970	683.9542	593.2759	502.0545	460.2745	450.7791	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.7267	52.8000	52.8720	53.2127	53.2770	53.5781	53.5781	53.6342	53.4617	53.2770	53.1471	53.0121	
alpha	4.5151	4.5200	4.5248	4.5475	4.5518	4.5719	4.5719	4.5756	4.5641	4.5518	4.5431	4.5341	
util living area	0.9970	0.9940	0.9860	0.9508	0.8519	0.6729	0.5150	0.5925	0.8495	0.9750	0.9941	0.9975	(86)
MIT	19.3950	19.5726	19.8817	20.3408	20.7278	20.9331	20.9843	20.9713	20.8020	20.3021	19.7757	19.3643	(87)
Th 2	19.8743	19.8756	19.8770	19.8834	19.8845	19.8901	19.8901	19.8911	19.8880	19.8845	19.8821	19.8796	(88)
util rest of house	0.9960	0.9921	0.9810	0.9329	0.8007	0.5776	0.3921	0.4633	0.7765	0.9626	0.9918	0.9967	(89)
MIT 2	18.4228	18.6006	18.9079	19.3574	19.7044	19.8602	19.8862	19.8830	19.7774	19.3292	18.8085	18.3963	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	18.7496	18.9274	19.2353	19.6879	20.0484	20.2209	20.2553	20.2488	20.1218	19.6562	19.1336	18.7217	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7496	18.9274	19.2353	19.6879	20.0484	20.2209	20.2553	20.2488	20.1218	19.6562	19.1336	18.7217	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9946	0.9898	0.9772	0.9290	0.8092	0.6077	0.4337	0.5068	0.7942	0.9593	0.9896	0.9955	(94)
Useful gains	467.2056	529.7273	586.9130	659.7597	644.3913	493.0319	333.4496	346.6582	471.1639	481.6294	455.4931	448.7385	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1357.3392	1315.8518	1193.0164	1004.1247	776.1165	519.6131	337.9103	355.4282	557.8923	841.9196	1121.4519	1356.7708	(97)
Space heating kWh	662.2594	528.2756	450.9409	247.9428	98.0035	0.0000	0.0000	0.0000	0.0000	268.0559	479.4904	675.5761	(98a)
Space heating requirement - total per year (kWh/year)												3410.5446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	662.2594	528.2756	450.9409	247.9428	98.0035	0.0000	0.0000	0.0000	0.0000	268.0559	479.4904	675.5761	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3410.5446	
Space heating per m2											(98c) / (4) =	45.6566	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	868.9704	684.0831	701.8365	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8383	0.9006	0.8534	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	728.4157	616.0744	598.9811	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	908.4293	860.8761	763.6339	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	129.6098	182.1325	122.5017	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.4024	45.5331	30.6254	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												108.5610	(107)
Energy for space heating												45.6566	(99)
Energy for space cooling												1.4533	(108)
Total												47.1098	(109)
Fabric Energy Efficiency (DFEE)												47.1	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											30.0000 / (5) =	0.1575	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000	(17)
Infiltration rate												0.4075	(18)
Number of sides sheltered												2	(19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.3464	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4416	0.4330	0.4243	0.3810	0.3723	0.3291	0.3291	0.3204	0.3464	0.3723	0.3897	0.4070	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			16.5300	1.1450	18.9275			(27)
Brickwork	64.9700	16.5300	48.4400	0.1800	8.7192			(29a)
Communal Wall	16.0500	2.1500	13.9000	0.1800	2.5020			(29a)
Lift Shaft Wall	12.2600		12.2600	0.1800	2.2068			(29a)
ColdRoof	74.7000		74.7000	0.1100	8.2170			(30)
Total net area of external elements Aum(A, m2)			167.9800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7225			(33)
Main dwelling								
Party Wall 1			21.3500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 238.6965 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	27.5000	0.0700	1.9250
E16 Corner (normal)	14.2600	0.0900	1.2834
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0500	1.4100
E15 Flat roof with parapet	32.7200	0.5600	18.3232
P4 Party wall - Roof (insulation at ceiling level)	7.4900	0.1200	0.8988
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.0200	0.1054

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	24.0288	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	66.7513	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.5598	37.3217	37.0884	35.9926	35.7875	34.8331	34.8331	34.6563	35.2007	35.7875	36.2023	36.6359	(38)
Heat transfer coeff	104.3111	104.0730	103.8397	102.7439	102.5388	101.5844	101.5844	101.4076	101.9520	102.5388	102.9536	103.3872	(39)
Average = Sum(39)m / 12 =												102.7429	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3964	1.3932	1.3901	1.3754	1.3727	1.3599	1.3599	1.3575	1.3648	1.3727	1.3782	1.3840	(40)
HLP (average)												1.3754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 60.7331 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	66.2596	64.4421	62.4578	59.9878	57.7845	55.4946	55.0188	56.9991	59.0301	61.3817	63.8734	66.1666	(44)
Energy conte	104.9390	91.7647	95.9952	82.1204	77.7890	68.2371	66.5404	70.5768	72.7901	83.2943	90.9994	103.6009	(45)
Energy content (annual)										Total = Sum(45)m =		1008.6473	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	89.1981	78.0000	81.5960	69.8023	66.1207	58.0016	56.5594	59.9902	61.8715	70.8002	77.3495	88.0607	(64)
										Total per year (kWh/year) = Sum(64)m =		857.3502	(64)
12Total per year (kWh/year)												857	(64)
Electric shower(s)													
	51.0123	45.4524	49.6322	47.3634	48.2522	46.0279	47.5622	48.2522	47.3634	49.6322	48.6990	51.0123	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		580.2617	(64a)

Heat gains from water heating, kWh/month

	35.0526	30.8631	32.8070	29.2914	28.5932	26.0074	26.0304	27.0606	27.3087	30.1081	31.5121	34.7683	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	104.9351	116.1781	104.9351	108.4329	104.9351	108.4329	104.9351	104.9351	108.4329	104.9351	108.4329	104.9351	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)													
	47.1137	45.9272	44.0955	40.6825	38.4317	36.1213	34.9871	36.3718	37.9288	40.4679	43.7668	46.7315	(72)
Total internal gains													
	418.3774	430.5925	412.0784	400.5836	380.2178	367.6671	353.8570	353.0833	363.5774	374.1983	395.6123	408.8173	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.5100	11.2829	0.6300	0.7000	0.7700	8.6550	(75)
Northwest	14.0200	11.2829	0.6300	0.7000	0.7700	48.3440	(81)

Solar gains	56.9990	116.0231	209.0366	343.2982	461.4601	491.9654	460.2235	366.8955	254.7144	141.7894	71.7195	46.5482	(83)
Total gains	475.3764	546.6155	621.1150	743.8818	841.6779	859.6324	814.0805	719.9788	618.2918	515.9877	467.3318	455.3656	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.4825	47.5911	47.6981	48.2068	48.3032	48.7570	48.7570	48.8420	48.5812	48.3032	48.1086	47.9068	
alpha	4.1655	4.1727	4.1799	4.2138	4.2202	4.2505	4.2505	4.2561	4.2387	4.2202	4.2072	4.1938	
util living area													
	0.9967	0.9937	0.9853	0.9505	0.8553	0.6832	0.5288	0.6078	0.8574	0.9753	0.9939	0.9973	(86)
MIT	19.1966	19.3887	19.7277	20.2346	20.6662	20.9101	20.9764	20.9587	20.7521	20.1957	19.6210	19.1718	(87)
Th 2	19.7661	19.7685	19.7709	19.7822	19.7843	19.7942	19.7942	19.7960	19.7904	19.7843	19.7801	19.7756	(88)
util rest of house													
	0.9956	0.9915	0.9800	0.9317	0.8022	0.5815	0.3937	0.4673	0.7825	0.9627	0.9914	0.9964	(89)
MIT 2	18.1450	18.3380	18.6757	19.1756	19.5648	19.7545	19.7886	19.7847	19.6526	19.1488	18.5786	18.1272	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	18.4985	18.6912	19.0293	19.5316	19.9350	20.1429	20.1879	20.1793	20.0222	19.5007	18.9290	18.4783	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4985	18.6912	19.0293	19.5316	19.9350	20.1429	20.1879	20.1793	20.0222	19.5007	18.9290	18.4783	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9889	0.9757	0.9269	0.8097	0.6131	0.4395	0.5147	0.7994	0.9587	0.9890	0.9950	(94)
Useful gains	472.5298	540.5484	606.0267	689.5365	681.5436	527.0006	357.7587	370.5431	494.2540	494.6946	462.1759	453.0904	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1481.0598	1435.2899	1301.0398	1092.3303	844.4086	563.0762	364.4703	383.2501	603.7820	912.6697	1217.8357	1476.1965	(97)
Space heating kWh													
	750.3463	601.2663	517.0897	290.0116	121.1716	0.0000	0.0000	0.0000	0.0000	310.9734	544.0751	761.1910	(98a)
Space heating requirement - total per year (kWh/year)												3896.1249	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	750.3463	601.2663	517.0897	290.0116	121.1716	0.0000	0.0000	0.0000	0.0000	310.9734	544.0751	761.1910	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3896.1249	
Space heating per m2											(98c) / (4) =	52.1570	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	954.8930	751.7243	770.6978	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8137	0.8793	0.8273	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	777.0165	661.0146	637.5932	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	964.8624	913.6683	805.7214	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	135.2490	187.9743	125.0874	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	33.8123	46.9936	31.2718	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												112.0777	(107)
Energy for space heating												52.1570	(99)
Energy for space cooling												1.5004	(108)
Total												53.6573	(109)
Fabric Energy Efficiency (TFEE)												53.7	(109)

Full SAP Calculation Printout

Plot Reference	P-46	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-46
Plot Address	Flat 19, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	70 C	**DER**	8.01	**TER**	16.91
Environmental	94 A	**% DER < TER**			52.63
CO_2 Emissions (t/year)	0.51	**DFEE**	47.11	**TFEE**	53.66
Compliance Check	See BREL	**% DFEE < TFEE**			12.20
% DPER < TPER	8.38	**DPER**	82.32	**TPER**	89.85

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8800 (17)
Infiltration rate		0.1440 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	64.9700	17.9300	47.0400	0.2100	9.8784	110.0000	5174.4001	(29a)
Communal Wall	16.0500	2.1500	13.9000	0.2100	2.9190	110.0000	1528.9999	(29a)
Lift Shaft Wall	12.2600		12.2600	0.1600	1.9616	110.0000	1348.6000	(29a)
ColdRoof	74.7000		74.7000	0.0900	6.7230	9.0000	672.3000	(30)
Total net area of external elements Aum(A, m2)			167.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.5925			(33)
Main dwelling								
Party Wall 1			21.3500	0.0000	0.0000	110.0000	2348.5000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17830.6301	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							238.6965	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	27.5000	0.0380	1.0450
E16	Corner (normal)	14.2600	0.0540	0.7700
E17	Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18	Party wall between dwellings	2.8500	0.0380	0.1083
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2	Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4	Jamb	28.2000	0.0160	0.4512
E15	Flat roof with parapet	32.7200	0.3000	9.8160
P4	Party wall - Roof (insulation at ceiling level)	7.4900	0.1010	0.7565
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.5582 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.1508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	(39)

Average = Sum(39)m / 12 = 90.5808

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	(40)
HLP (average)												1.2126	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)

Energy content (annual) Total = Sum(45)m = 1984.2299

Distribution loss (46)m = 0.15 x (45)m

30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)

Total per year (kWh/year) = Sum(64)m = 2301.5609 (64)

12Total per year (kWh/year) 2302 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9168	116.1579	104.9168	108.4140	104.9168	108.4140	104.9168	104.9168	108.4140	104.9168	108.4140	104.9168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains	463.2294	474.2558	453.0037	434.9013	410.6494	393.9932	377.3778	378.4747	391.2280	406.4287	434.1485	452.7703	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	51.4052	104.6368	188.5223	309.6077	416.1736	443.6851	415.0583	330.8893	229.7173	127.8745	64.6811	41.9801	(83)
Total gains	514.6346	578.8926	641.5260	744.5090	826.8229	837.6783	792.4361	709.3640	620.9453	534.3032	498.8296	494.7504	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	
alpha	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	
util living area	0.9956	0.9917	0.9813	0.9400	0.8305	0.6480	0.4925	0.5659	0.8255	0.9676	0.9918	0.9963	(86)
MIT	19.5287	19.6994	19.9941	20.4173	20.7709	20.9457	20.9878	20.9775	20.8347	20.3748	19.8758	19.4868	(87)
Th 2	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	(88)
util rest of house	0.9942	0.9890	0.9750	0.9193	0.7767	0.5548	0.3758	0.4422	0.7488	0.9524	0.9886	0.9952	(89)
MIT 2	18.2069	18.4245	18.7979	19.3195	19.7184	19.8792	19.9061	19.9019	19.7942	19.2787	18.6507	18.1535	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	18.6512	18.8530	19.2000	19.6885	20.0722	20.2377	20.2697	20.2635	20.1440	19.6472	19.0625	18.6016	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6512	18.8530	19.2000	19.6885	20.0722	20.2377	20.2697	20.2635	20.1440	19.6472	19.0625	18.6016	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9918	0.9854	0.9695	0.9142	0.7855	0.5842	0.4151	0.4838	0.7674	0.9476	0.9851	0.9931	(94)
Useful gains	510.4123	570.4469	621.9754	680.6401	649.5068	489.3591	328.9669	343.1727	476.5414	506.3051	491.4080	491.3373	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1299.9447	1263.8758	1150.3781	977.2318	758.3570	510.6691	332.4028	349.9554	547.4685	819.5015	1083.5737	1304.5120	(97)
Space heating kWh	587.4120	465.9842	393.1316	213.5460	80.9846	0.0000	0.0000	0.0000	0.0000	233.0181	426.3593	605.0020	(98a)
Space heating requirement - total per year (kWh/year)												3005.4378	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	587.4120	465.9842	393.1316	213.5460	80.9846	0.0000	0.0000	0.0000	0.0000	233.0181	426.3593	605.0020	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3005.4378	
Space heating per m2											(98c) / (4) =	40.2334	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	587.4120	465.9842	393.1316	213.5460	80.9846	0.0000	0.0000	0.0000	0.0000	233.0181	426.3593	605.0020	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	587.4120	465.9842	393.1316	213.5460	80.9846	0.0000	0.0000	0.0000	0.0000	233.0181	426.3593	605.0020	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3005.4378	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	709.2200	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3935.3348	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3005.4378	0.1552	466.3678	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			566.4977	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			598.0766	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.0100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3005.4378	1.5745	4732.0769	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			5811.5506	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			6149.0157	(286)
Dwelling Primary energy Rate (DPER)			82.3200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1575	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4075	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3464	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3723	0.3291	0.3291	0.3204	0.3464	0.3723	0.3897	0.4070	(22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			16.5300	1.1450	18.9275			(27)
Brickwork	64.9700	16.5300	48.4400	0.1800	8.7192			(29a)
Communal Wall	16.0500	2.1500	13.9000	0.1800	2.5020			(29a)
Lift Shaft Wall	12.2600		12.2600	0.1800	2.2068			(29a)
ColdRoof	74.7000		74.7000	0.1100	8.2170			(30)
Total net area of external elements Aum(A, m2)			167.9800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.7225			(33)
Main dwelling								
Party Wall 1			21.3500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 238.6965 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	27.5000	0.0700	1.9250
E16 Corner (normal)	14.2600	0.0900	1.2834
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0500	1.4100
E15 Flat roof with parapet	32.7200	0.5600	18.3232
P4 Party wall - Roof (insulation at ceiling level)	7.4900	0.1200	0.8988
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.0200	0.1054

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 24.0288 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.7513 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.5598	37.3217	37.0884	35.9926	35.7875	34.8331	34.8331	34.6563	35.2007	35.7875	36.2023	36.6359	(38)
Heat transfer coeff	104.3111	104.0730	103.8397	102.7439	102.5388	101.5844	101.5844	101.4076	101.9520	102.5388	102.9536	103.3872	(39)
Average = Sum(39)m / 12 =												102.7429	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3964	1.3932	1.3901	1.3754	1.3727	1.3599	1.3599	1.3575	1.3648	1.3727	1.3782	1.3840	(40)
HLP (average)												1.3754	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	252.4175	223.1938	236.8779	207.5392	200.7241	180.3575	177.5526	184.8368	187.1391	209.3051	223.3528	249.5509	(62)
WWHRS	-29.1205	-25.7544	-26.9686	-22.3310	-20.8117	-17.8087	-16.6928	-17.7512	-18.4256	-21.7218	-24.6081	-28.5813	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
										Total per year (kWh/year) = Sum(64)m =		2262.2716	(64)
12Total per year (kWh/year)												2262	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	105.7120	93.8870	100.5450	90.0872	88.5239	81.0493	80.8194	83.2414	83.3042	91.3771	95.3452	104.7588	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	117.7313	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.9351	116.1781	104.9351	108.4329	104.9351	108.4329	104.9351	104.9351	108.4329	104.9351	108.4329	104.9351	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	208.0093	210.1678	204.7285	193.1488	178.5316	164.7934	155.6155	153.4570	158.8963	170.4760	185.0932	198.8314	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	34.7731	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	142.0860	139.7128	135.1411	125.1212	118.9837	112.5685	108.6282	111.8835	115.7003	122.8186	132.4240	140.8048	(72)
Total internal gains	516.3497	527.3781	506.1240	488.0222	463.7697	444.1142	427.4981	428.5950	441.3489	459.5491	487.2695	505.8906	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.5100	11.2829	0.6300	0.7000	0.7700	8.6550	(75)
Northwest	14.0200	11.2829	0.6300	0.7000	0.7700	48.3440	(81)

Solar gains	56.9990	116.0231	209.0366	343.2982	461.4601	491.9654	460.2235	366.8955	254.7144	141.7894	71.7195	46.5482	(83)
Total gains	573.3487	643.4011	715.1607	831.3204	925.2299	936.0795	887.7216	795.4905	696.0633	601.3384	558.9889	552.4388	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.4825	47.5911	47.6981	48.2068	48.3032	48.7570	48.7570	48.8420	48.5812	48.3032	48.1086	47.9068	
alpha	4.1655	4.1727	4.1799	4.2138	4.2202	4.2505	4.2505	4.2561	4.2387	4.2202	4.2072	4.1938	
util living area	0.9934	0.9886	0.9761	0.9307	0.8204	0.6417	0.4896	0.5598	0.8134	0.9591	0.9882	0.9944	(86)
MIT	19.3328	19.5209	19.8503	20.3298	20.7222	20.9292	20.9823	20.9697	20.8036	20.3007	19.7464	19.3075	(87)
Th 2	19.7661	19.7685	19.7709	19.7822	19.7843	19.7942	19.7942	19.7960	19.7904	19.7843	19.7801	19.7756	(88)
util rest of house	0.9913	0.9848	0.9679	0.9065	0.7616	0.5411	0.3623	0.4259	0.7292	0.9398	0.9837	0.9926	(89)
MIT 2	17.8594	18.1002	18.5180	19.1146	19.5566	19.7553	19.7889	19.7857	19.6572	19.0941	18.3968	17.8334	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	18.3546	18.5777	18.9659	19.5231	19.9484	20.1499	20.1901	20.1837	20.0426	19.4997	18.8504	18.3289	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3546	18.5777	18.9659	19.5231	19.9484	20.1499	20.1901	20.1837	20.0426	19.4997	18.8504	18.3289	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9877	0.9797	0.9607	0.9002	0.7705	0.5724	0.4053	0.4709	0.7492	0.9338	0.9787	0.9894	(94)
Useful gains	566.3020	630.3570	687.0606	748.3404	712.8973	535.8477	359.7525	374.5803	521.4812	561.5547	547.0946	546.5810	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1466.0550	1423.4844	1294.4512	1091.4563	845.7806	563.7830	364.6970	383.6974	605.8552	912.5650	1209.7505	1460.7487	(97)
Space heating kWh	669.4162	532.9816	451.8987	247.0434	98.8652	0.0000	0.0000	0.0000	0.0000	261.1516	477.1123	680.1407	(98a)
Space heating requirement - total per year (kWh/year)												3418.6098	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	669.4162	532.9816	451.8987	247.0434	98.8652	0.0000	0.0000	0.0000	0.0000	261.1516	477.1123	680.1407	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3418.6098	
Space heating per m2											(98c) / (4) =	45.7645	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	669.4162	532.9816	451.8987	247.0434	98.8652	0.0000	0.0000	0.0000	0.0000	261.1516	477.1123	680.1407	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	725.2614	577.4449	489.5977	267.6527	107.1129	0.0000	0.0000	0.0000	0.0000	282.9378	516.9147	736.8805	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	223.2970	197.4393	209.9093	185.2082	179.9124	162.5488	160.8597	167.0856	168.7135	187.5833	198.7447	220.9696	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3636	86.1729	85.7332	84.7066	82.7752	79.8000	79.8000	79.8000	79.8000	84.8019	85.9495	86.4102	(217)
Fuel for water heating, kWh/month	258.5544	229.1199	244.8402	218.6466	217.3506	203.6952	201.5786	209.3805	211.4205	221.2017	231.2343	255.7216	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.8034	17.4915	15.7492	11.5385	8.9127	7.2817	8.1305	10.5683	13.7271	18.0107	20.3431	22.4094	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.9677	-29.5587	-44.5886	-52.6946	-59.0696	-55.9572	-55.2711	-51.0588	-44.0275	-34.9131	-22.4456	-17.1028	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.3761	-15.8411	-32.0982	-49.1221	-65.8539	-66.5010	-65.7221	-55.2352	-39.9462	-22.9546	-9.9435	-5.8092	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3703.8026	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2702.7442	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.9662	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-923.0586	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5745.4544	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3703.8026	0.2100	777.7985	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2702.7442	0.2100	567.5763	(264)
Space and water heating			1345.3748	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.9662	0.1443	25.3974	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6552	0.1336	-65.0038	
PV Unit electricity exported	-436.4034	0.1253	-54.7027	
Total			-119.7065	(269)
Total CO2, kg/year			1262.9950	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3703.8026	1.1300	4185.2969	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2702.7442	1.1300	3054.1010	(278)
Space and water heating			7239.3979	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.9662	1.5338	269.9029	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-486.6552	1.4936	-726.8702	
PV Unit electricity exported	-436.4034	0.4601	-200.7849	
Total			-927.6551	(283)
Total Primary energy kWh/year			6711.7464	(286)
Target Primary Energy Rate (TPER)			89.8500	(287)

Full SAP Calculation Printout

Plot Reference	P-46	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-46
Plot Address	Flat 19, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	70 C	**DER**	8.01	**TER**	16.91
Environmental	94 A	**% DER < TER**			52.63
CO_2 Emissions (t/year)	0.51	**DFEE**	47.11	**TFEE**	53.66
Compliance Check	See BREL	**% DFEE < TFEE**			12.20
% DPER < TPER	8.38	**DPER**	82.32	**TPER**	89.85

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	190.4850	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			2.8800 (17)
Infiltration rate			0.1440 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1224 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	64.9700	17.9300	47.0400	0.2100	9.8784	110.0000	5174.4001	(29a)
Communal Wall	16.0500	2.1500	13.9000	0.2100	2.9190	110.0000	1528.9999	(29a)
Lift Shaft Wall	12.2600		12.2600	0.1600	1.9616	110.0000	1348.6000	(29a)
ColdRoof	74.7000		74.7000	0.0900	6.7230	9.0000	672.3000	(30)
Total net area of external elements Aum(A, m2)			167.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.5925			(33)
Main dwelling								
Party Wall 1			21.3500	0.0000	0.0000	110.0000	2348.5000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17830.6301	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							238.6965	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	27.5000	0.0380	1.0450
E16	Corner (normal)	14.2600	0.0540	0.7700
E17	Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18	Party wall between dwellings	2.8500	0.0380	0.1083
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2	Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4	Jamb	28.2000	0.0160	0.4512
E15	Flat roof with parapet	32.7200	0.3000	9.8160
P4	Party wall - Roof (insulation at ceiling level)	7.4900	0.1010	0.7565
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.5582 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.1508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	(39)

Average = Sum(39)m / 12 = 90.5808

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	(40)
HLP (average)												1.2126	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers

63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day) 119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)

Energy content (annual) Total = Sum(45)m = 1984.2299

Distribution loss (46)m = 0.15 x (45)m

30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)

Total per year (kWh/year) = Sum(64)m = 2301.5609 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	51.4052	104.6368	188.5223	309.6077	416.1736	443.6851	415.0583	330.8893	229.7173	127.8745	64.6811	41.9801	(83)
Total gains	576.8221	628.1744	695.3233	784.8246	860.0677	859.1060	813.5186	732.1111	646.9208	573.7604	545.3576	553.0955	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	
alpha	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	
util living area	0.9929	0.9885	0.9748	0.9291	0.8142	0.6352	0.4807	0.5505	0.8084	0.9584	0.9883	0.9942	(86)
MIT	19.6175	19.7683	20.0651	20.4604	20.7910	20.9500	20.9889	20.9799	20.8499	20.4232	19.9408	19.5705	(87)
Th 2	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	(88)
util rest of house	0.9907	0.9849	0.9665	0.9056	0.7583	0.5426	0.3663	0.4291	0.7290	0.9397	0.9839	0.9924	(89)
MIT 2	18.3199	18.5116	18.8858	19.3691	19.7373	19.8819	19.9065	19.9028	19.8067	19.3359	18.7327	18.2601	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	18.7561	18.9340	19.2822	19.7359	20.0915	20.2409	20.2703	20.2649	20.1574	19.7014	19.1388	18.7006	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7561	18.9340	19.2822	19.7359	20.0915	20.2409	20.2703	20.2649	20.1574	19.7014	19.1388	18.7006	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9805	0.9604	0.9011	0.7686	0.5720	0.4049	0.4700	0.7492	0.9352	0.9796	0.9895	(94)
Useful gains	569.5918	615.9231	667.7780	707.2146	661.0097	491.3886	329.3636	344.0570	484.6439	536.5634	534.2305	547.2902	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1309.4421	1271.2129	1157.8230	981.5257	760.1080	510.9581	332.4614	350.0840	548.6844	824.4144	1090.4827	1313.4771	(97)
Space heating kWh	550.4486	440.3547	364.5935	197.5040	73.7291	0.0000	0.0000	0.0000	0.0000	214.1612	400.5016	570.0431	(98a)
Space heating requirement - total per year (kWh/year)												2811.3358	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	550.4486	440.3547	364.5935	197.5040	73.7291	0.0000	0.0000	0.0000	0.0000	214.1612	400.5016	570.0431	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2811.3358	
Space heating per m2											(98c) / (4) =	37.6350	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	550.4486	440.3547	364.5935	197.5040	73.7291	0.0000	0.0000	0.0000	0.0000	214.1612	400.5016	570.0431	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	550.4486	440.3547	364.5935	197.5040	73.7291	0.0000	0.0000	0.0000	0.0000	214.1612	400.5016	570.0431	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2811.3358	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												709.2200	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3741.2329	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2811.3358	16.4900	463.5893	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	16.4900	116.9504	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	16.4900	7.9708	(249)
Energy for lighting	172.3395	16.4900	28.4188	(250)
Additional standing charges			0.0000	(251)
Total energy cost			616.9293	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.8554	(257)
SAP value		69.9235	
SAP rating (Section 12)		70	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2811.3358	0.1552	436.4567	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			536.5865	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			568.1654	(272)
CO2 emissions per m2			7.6100	(273)
EI value			93.6396	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b)	x 2.5500	(2b) =	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		190.4850	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50												2.8800	(17)
Infiltration rate												0.1440	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1224	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1316	0.1255	0.1255	0.1163	0.1193	0.1040	0.1040	0.1010	0.1040	0.1163	0.1132	0.1224	(22b)

Mechanical extract ventilation - centralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	64.9700	17.9300	47.0400	0.2100	9.8784	110.0000	5174.4001	(29a)
Communal Wall	16.0500	2.1500	13.9000	0.2100	2.9190	110.0000	1528.9999	(29a)
Lift Shaft Wall	12.2600		12.2600	0.1600	1.9616	110.0000	1348.6000	(29a)
ColdRoof	74.7000		74.7000	0.0900	6.7230	9.0000	672.3000	(30)
Total net area of external elements Aum(A, m2)			167.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.5925			(33)
Main dwelling								
Party Wall 1			21.3500	0.0000	0.0000	110.0000	2348.5000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17830.6301	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	238.6965	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	27.5000	0.0380	1.0450
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E15 Flat roof with parapet	32.7200	0.3000	9.8160
P4 Party wall - Roof (insulation at ceiling level)	7.4900	0.1010	0.7565
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.5582	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	59.1508	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	(39)
Average = Sum(39)m / 12 =												90.5808	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	(40)
HLP (average)												1.2126	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3546	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)
Hot water usage for baths	27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)
Hot water usage for other uses	38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)
Average daily hot water use (litres/day)												119.4615	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)

											Total per year (kWh/year) = Sum(64)m =	2301.5609	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)													
	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains													
	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(81)
Northeast	2.7200	13.7804	0.3300	0.0000	0.7700	9.5244	(75)
Northwest	9.7900	13.7804	0.3300	0.0000	0.7700	34.2807	(81)

Solar gains	62.7838	112.2881	201.6306	335.8449	438.2676	493.1378	457.2361	375.0305	261.9555	147.5831	77.9598	51.4724	(83)
Total gains	588.2006	635.8257	708.4316	811.0618	882.1618	908.5587	855.6964	776.2523	679.1589	593.4690	558.6363	562.5878	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	
alpha	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	
util living area													
	0.9907	0.9853	0.9660	0.8986	0.7397	0.5063	0.3476	0.3935	0.7209	0.9370	0.9833	0.9922	(86)
MIT	19.7388	19.8831	20.1946	20.5931	20.8807	20.9838	20.9978	20.9963	20.9208	20.5522	20.0760	19.7027	(87)
Th 2	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	(88)
util rest of house													
	0.9877	0.9805	0.9545	0.8654	0.6679	0.4059	0.2337	0.2691	0.6200	0.9083	0.9768	0.9897	(89)
MIT 2	18.4745	18.6573	19.0475	19.5234	19.8235	19.9033	19.9096	19.9093	19.8653	19.4896	18.9037	18.4289	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	18.8995	19.0693	19.4331	19.8830	20.1789	20.2665	20.2754	20.2747	20.2201	19.8468	19.2977	18.8571	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8995	19.0693	19.4331	19.8830	20.1789	20.2665	20.2754	20.2747	20.2201	19.8468	19.2977	18.8571	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9755	0.9481	0.8645	0.6869	0.4395	0.2721	0.3111	0.6510	0.9063	0.9718	0.9862	(94)
Useful gains	578.6775	620.2737	671.6921	701.1495	605.9423	399.2915	232.8766	241.5260	442.1503	537.8503	542.8773	554.8266	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
1249.9692	1211.0036	1089.9670	904.2673	659.3271	404.5817	233.2820	242.2730	472.8404	756.0601	1023.3576	1246.1266		(97)
Space heating kWh													
499.4410	396.9705	311.1966	146.2448	39.7183	0.0000	0.0000	0.0000	0.0000	162.3481	345.9458	514.3272		(98a)
Space heating requirement - total per year (kWh/year)												2416.1923	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
499.4410	396.9705	311.1966	146.2448	39.7183	0.0000	0.0000	0.0000	0.0000	162.3481	345.9458	514.3272		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2416.1923	
Space heating per m2											(98c) / (4) =	32.3453	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	499.4410	396.9705	311.1966	146.2448	39.7183	0.0000	0.0000	0.0000	0.0000	162.3481	345.9458	514.3272	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)
499.4410 396.9705 311.1966 146.2448 39.7183 0.0000 0.0000 0.0000 0.0000 162.3481 345.9458 514.3272 (211)
Space heating efficiency (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (212)
Space heating fuel (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (213)
Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
232.7740 205.4512 217.2344 188.5294 181.0806 161.3476 157.9091 165.1933 168.1293 189.6616 204.3430 229.9074 (64)
Efficiency of water heater 324.5200 (216)
(217)m 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 (217)
Fuel for water heating, kWh/month
71.7287 63.3093 66.9402 58.0948 55.7995 49.7189 48.6593 50.9039 51.8086 58.4437 62.9678 70.8454 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 4.1054 3.7081 4.1054 3.9729 4.1054 3.9729 4.1054 4.1054 3.9729 4.1054 3.9729 4.1054 (231)
Lighting 21.3541 17.1310 15.4246 11.3007 8.7290 7.1317 7.9629 10.3505 13.4442 17.6395 19.9238 21.9476 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 2416.1923 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 709.2200 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 48.3375 (230a)
Total electricity for the above, kWh/year 48.3375 (231)
Electricity for lighting (calculated in Appendix L) 172.3395 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 3346.0893 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2416.1923	27.6700	668.5604	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	27.6700	196.2412	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	27.6700	13.3750	(249)
Energy for lighting	172.3395	27.6700	47.6863	(250)
Additional standing charges			0.0000	(251)
Total energy cost			925.8629	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2416.1923	0.1560	376.8456	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			476.9754	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			508.5543	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2416.1923	1.5774	3811.3863	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	1.5221	1079.4737	(278)
Space and water heating			4890.8601	(279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249	(281)
Energy for lighting	172.3395	1.5338	264.3401	(282)
Total Primary energy kWh/year			5228.3251	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 70
Current environmental impact rating: A 94

N	Solar water heating		Not applicable
U	Solar photovoltaic panels		Not applicable
V2	Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 70
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£926	£926	£0
Space heating	£682	£682	£0
Water heating	£196	£196	£0
Lighting	£48	£48	£0
Total cost of fuels	£926	£926	£0
Total cost of uses	£926	£926	£0
Delivered energy	45 kWh/m²	45 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	70 kWh/m²	70 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000 (1b)	x	2.5500 (2b)	=	190.4850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.4850	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8800	(17)
Infiltration rate		0.1440	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	64.9700	17.9300	47.0400	0.2100	9.8784	110.0000	5174.4001	(29a)
Communal Wall	16.0500	2.1500	13.9000	0.2100	2.9190	110.0000	1528.9999	(29a)
Lift Shaft Wall	12.2600		12.2600	0.1600	1.9616	110.0000	1348.6000	(29a)
ColdRoof	74.7000		74.7000	0.0900	6.7230	9.0000	672.3000	(30)
Total net area of external elements Aum(A, m2)			167.9800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.5925			(33)
Main dwelling								
Party Wall 1			21.3500	0.0000	0.0000	110.0000	2348.5000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17830.6301 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		238.6965 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	27.5000	0.0380	1.0450
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E15 Flat roof with parapet	32.7200	0.3000	9.8160
P4 Party wall - Roof (insulation at ceiling level)	7.4900	0.1010	0.7565
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.5582 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	59.1508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	(39)
Average = Sum(39)m / 12 =												90.5808	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	(40)
HLP (average)												1.2126	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.3546 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549	(42a)

Hot water usage for baths

27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229	(42b)

Hot water usage for other uses

38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437	(42c)

Average daily hot water use (litres/day)		119.4615 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)

Water storage loss (or HIU loss):		
Store volume		200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.6100 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)

	Total per year (kWh/year) = Sum(64)m =	2301.5609 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850 (71)
Water heating gains (Table 5)												
	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028 (72)
Total internal gains												
	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
Northwest	9.7900	11.2829	0.3300	0.0000	0.7700	28.0679	(81)

Solar gains	51.4052	104.6368	188.5223	309.6077	416.1736	443.6851	415.0583	330.8893	229.7173	127.8745	64.6811	41.9801	(83)
Total gains	576.8221	628.1744	695.3233	784.8246	860.0677	859.1060	813.5186	732.1111	646.9208	573.7604	545.3576	553.0955	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	
alpha	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	
util living area	0.9929	0.9885	0.9748	0.9291	0.8142	0.6352	0.4807	0.5505	0.8084	0.9584	0.9883	0.9942	(86)
MIT	19.6175	19.7683	20.0651	20.4604	20.7910	20.9500	20.9889	20.9799	20.8499	20.4232	19.9408	19.5705	(87)
Th 2	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	(88)
util rest of house	0.9907	0.9849	0.9665	0.9056	0.7583	0.5426	0.3663	0.4291	0.7290	0.9397	0.9839	0.9924	(89)
MIT 2	18.3199	18.5116	18.8858	19.3691	19.7373	19.8819	19.9065	19.9028	19.8067	19.3359	18.7327	18.2601	(90)
Living area fraction										fLA = Living area / (4) =		0.3361	(91)
MIT	18.7561	18.9340	19.2822	19.7359	20.0915	20.2409	20.2703	20.2649	20.1574	19.7014	19.1388	18.7006	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7561	18.9340	19.2822	19.7359	20.0915	20.2409	20.2703	20.2649	20.1574	19.7014	19.1388	18.7006	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9805	0.9604	0.9011	0.7686	0.5720	0.4049	0.4700	0.7492	0.9352	0.9796	0.9895	(94)
Useful gains	569.5918	615.9231	667.7780	707.2146	661.0097	491.3886	329.3636	344.0570	484.6439	536.5634	534.2305	547.2902	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1309.4421	1271.2129	1157.8230	981.5257	760.1080	510.9581	332.4614	350.0840	548.6844	824.4144	1090.4827	1313.4771	(97)
Space heating kWh	550.4486	440.3547	364.5935	197.5040	73.7291	0.0000	0.0000	0.0000	0.0000	214.1612	400.5016	570.0431	(98a)
Space heating requirement - total per year (kWh/year)												2811.3358	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	550.4486	440.3547	364.5935	197.5040	73.7291	0.0000	0.0000	0.0000	0.0000	214.1612	400.5016	570.0431	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2811.3358	
Space heating per m2											(98c) / (4) =	37.6350	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	550.4486	440.3547	364.5935	197.5040	73.7291	0.0000	0.0000	0.0000	0.0000	214.1612	400.5016	570.0431	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	550.4486	440.3547	364.5935	197.5040	73.7291	0.0000	0.0000	0.0000	0.0000	214.1612	400.5016	570.0431	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating

Water heating requirement	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2811.3358	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	709.2200	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3741.2329	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2811.3358	16.4900	463.5893	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	16.4900	116.9504	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	16.4900	7.9708	(249)
Energy for lighting	172.3395	16.4900	28.4188	(250)
Additional standing charges			0.0000	(251)
Total energy cost			616.9293	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.8554	(257)
SAP value		69.9235	
SAP rating (Section 12)		70	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2811.3358	0.1552	436.4567	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	709.2200	0.1412	100.1298	(264)
Space and water heating			536.5865	(265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050	(267)
Energy for lighting	172.3395	0.1443	24.8739	(268)
Total CO2, kg/year			568.1654	(272)
CO2 emissions per m2			7.6100	(273)
EI value			93.6396	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	74.7000	(1b) x	2.5500	(2b) =	190.4850	(1b) - (3b)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 74.7000 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 190.4850 (5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8800	(17)
Infiltration rate		0.1440	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1316	0.1255	0.1255	0.1163	0.1193	0.1040	0.1040	0.1010	0.1040	0.1163	0.1132	0.1224	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			12.5100	1.1450	14.3244			(27)
Brickwork	64.9700	17.9300	47.0400	0.2100	9.8784	110.0000	5174.4001	(29a)
Communal Wall	16.0500	2.1500	13.9000	0.2100	2.9190	110.0000	1528.9999	(29a)
Lift Shaft Wall	12.2600		12.2600	0.1600	1.9616	110.0000	1348.6000	(29a)
ColdRoof	74.7000		74.7000	0.0900	6.7230	9.0000	672.3000	(30)
Total net area of external elements Aum(A, m2)			167.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.5925			(33)
Main dwelling								
Party Wall 1			21.3500	0.0000	0.0000	110.0000	2348.5000	(32)
Party Floor 1			74.7000			70.0000	5229.0000	(32d)
Internal Wall 1			169.8700			9.0000	1528.8300	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17830.6301 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 238.6965 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	27.5000	0.0380	1.0450
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.4900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E4 Jamb	28.2000	0.0160	0.4512
E15 Flat roof with parapet	32.7200	0.3000	9.8160
P4 Party wall - Roof (insulation at ceiling level)	7.4900	0.1010	0.7565
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.2700	0.3300	1.7391

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.5582 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.1508 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	31.4300	(38)
Heat transfer coeff	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	90.5808	(39)
Average = Sum(39)m / 12 =												90.5808	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	1.2126	(40)
HLP (average)												1.2126	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3546 (42)

Hot water usage for mixer showers	63.6990	62.7417	61.3468	58.6778	56.7082	54.5117	53.2632	54.6476	56.1651	58.5235	61.2498	63.4549 (42a)
Hot water usage for baths	27.5159	27.1072	26.5318	25.4707	24.6762	23.7952	23.3194	23.8908	24.5130	25.4557	26.5386	27.4229 (42b)
Hot water usage for other uses	38.7437	37.3349	35.9260	34.5171	33.1083	31.6994	31.6994	33.1083	34.5171	35.9260	37.3349	38.7437 (42c)
Average daily hot water use (litres/day)												119.4615 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use

	129.9586	127.1838	123.8045	118.6657	114.4927	110.0064	108.2820	111.6467	115.1953	119.9052	125.1232	129.6215	(44)
Energy conte	205.8226	181.1080	190.2830	162.4474	154.1292	135.2656	130.9577	138.2419	142.0473	162.7102	178.2610	202.9560	(45)
Energy content (annual)										Total = Sum(45)m =		1984.2299	
Distribution loss (46)m = 0.15 x (45)m													
	30.8734	27.1662	28.5424	24.3671	23.1194	20.2898	19.6437	20.7363	21.3071	24.4065	26.7391	30.4434	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
										Total per year (kWh/year) = Sum(64)m =		2301.5609	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	68.4360	60.2184	63.2691	54.0138	51.2480	44.9758	43.5434	45.9654	47.2307	54.1011	59.2718	67.4829	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	141.2775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.3964	21.6687	17.6222	13.3411	9.9726	8.4193	9.0974	11.8251	15.8716	20.1527	23.5212	25.0745	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	310.4616	313.6832	305.5649	288.2818	266.4650	245.9603	232.2619	229.0403	237.1587	254.4418	276.2585	296.7632	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	51.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	-94.1850	(71)
Water heating gains (Table 5)													
	91.9839	89.6108	85.0391	75.0191	68.8817	62.4664	58.5261	61.7815	65.5982	72.7166	82.3219	90.7028	(72)
Total internal gains													
	525.4168	523.5376	506.8010	475.2169	443.8942	415.4210	398.4603	401.2218	417.2035	445.8859	480.6765	511.1154	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(81)
Northeast	2.7200	13.7804	0.3300	0.0000	0.7700	9.5244	(75)
Northwest	9.7900	13.7804	0.3300	0.0000	0.7700	34.2807	(81)

Solar gains	62.7838	112.2881	201.6306	335.8449	438.2676	493.1378	457.2361	375.0305	261.9555	147.5831	77.9598	51.4724	(83)
Total gains	588.2006	635.8257	708.4316	811.0618	882.1618	908.5587	855.6964	776.2523	679.1589	593.4690	558.6363	562.5878	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	54.6799	
alpha	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	4.6453	
util living area													
	0.9907	0.9853	0.9660	0.8986	0.7397	0.5063	0.3476	0.3935	0.7209	0.9370	0.9833	0.9922	(86)
MIT	19.7388	19.8831	20.1946	20.5931	20.8807	20.9838	20.9978	20.9963	20.9208	20.5522	20.0760	19.7027	(87)
Th 2	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	19.9099	(88)
util rest of house													
	0.9877	0.9805	0.9545	0.8654	0.6679	0.4059	0.2337	0.2691	0.6200	0.9083	0.9768	0.9897	(89)
MIT 2	18.4745	18.6573	19.0475	19.5234	19.8235	19.9033	19.9096	19.9093	19.8653	19.4896	18.9037	18.4289	(90)
Living area fraction									fLA = Living area / (4) =			0.3361	(91)
MIT	18.8995	19.0693	19.4331	19.8830	20.1789	20.2665	20.2754	20.2747	20.2201	19.8468	19.2977	18.8571	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8995	19.0693	19.4331	19.8830	20.1789	20.2665	20.2754	20.2747	20.2201	19.8468	19.2977	18.8571	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9755	0.9481	0.8645	0.6869	0.4395	0.2721	0.3111	0.6510	0.9063	0.9718	0.9862	(94)
Useful gains	578.6775	620.2737	671.6921	701.1495	605.9423	399.2915	232.8766	241.5260	442.1503	537.8503	542.8773	554.8266	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1249.9692	1211.0036	1089.9670	904.2673	659.3271	404.5817	233.2820	242.2730	472.8404	756.0601	1023.3576	1246.1266	(97)
Space heating kWh													
	499.4410	396.9705	311.1966	146.2448	39.7183	0.0000	0.0000	0.0000	0.0000	162.3481	345.9458	514.3272	(98a)
Space heating requirement - total per year (kWh/year)												2416.1923	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

499.4410	396.9705	311.1966	146.2448	39.7183	0.0000	0.0000	0.0000	0.0000	162.3481	345.9458	514.3272	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2416.1923

Space heating per m2 (98c) / (4) = 32.3453 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	499.4410	396.9705	311.1966	146.2448	39.7183	0.0000	0.0000	0.0000	0.0000	162.3481	345.9458	514.3272	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	499.4410	396.9705	311.1966	146.2448	39.7183	0.0000	0.0000	0.0000	0.0000	162.3481	345.9458	514.3272	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	232.7740	205.4512	217.2344	188.5294	181.0806	161.3476	157.9091	165.1933	168.1293	189.6616	204.3430	229.9074	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	71.7287	63.3093	66.9402	58.0948	55.7995	49.7189	48.6593	50.9039	51.8086	58.4437	62.9678	70.8454	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.1054	3.7081	4.1054	3.9729	4.1054	3.9729	4.1054	4.1054	3.9729	4.1054	3.9729	4.1054	(231)
Lighting	21.3541	17.1310	15.4246	11.3007	8.7290	7.1317	7.9629	10.3505	13.4442	17.6395	19.9238	21.9476	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	2416.1923	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	709.2200	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)

mechanical ventilation fans (SFP = 0.2080)	48.3375	(230a)
Total electricity for the above, kWh/year	48.3375	(231)
Electricity for lighting (calculated in Appendix L)	172.3395	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3346.0893	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2416.1923	27.6700	668.5604	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	709.2200	27.6700	196.2412	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	48.3375	27.6700	13.3750	(249)
Energy for lighting	172.3395	27.6700	47.6863	(250)
Additional standing charges			0.0000	(251)
Total energy cost			925.8629	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2416.1923	0.1560	376.8456	(261)

Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	709.2200	0.1412	100.1298 (264)
Space and water heating			476.9754 (265)
Pumps, fans and electric keep-hot	48.3375	0.1387	6.7050 (267)
Energy for lighting	172.3395	0.1443	24.8739 (268)
Total CO2, kg/year			508.5543 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2416.1923	1.5774	3811.3863 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	709.2200	1.5221	1079.4737 (278)
Space and water heating			4890.8601 (279)
Pumps, fans and electric keep-hot	48.3375	1.5128	73.1249 (281)
Energy for lighting	172.3395	1.5338	264.3401 (282)
Total Primary energy kWh/year			5228.3251 (286)

Summary for Input Data

Plot Reference	P-47	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-47
Plot Address	Flat 20, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	75 C	**DER**	7.56	**TER**	17.43
Environmental	95 A	**% DER < TER**			56.63
CO_2 Emissions (t/year)	0.35	**DFEE**	42.69	**TFEE**	48.78
Compliance Check	See BREL	**% DFEE < TFEE**			12.49
% DPER < TPER	16.28	**DPER**	77.80	**TPER**	92.93

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	277.16	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	33.89 m	54.90 m²	2.55 m

8.0 Living Area	24.44	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	54.45	39.77	0.00	None	14.68	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	18.08	15.93	0.70	Stairwell Access Corridor 3	2.15	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	9.61	9.61	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	25.54	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	98.28

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
ColdRoof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	54.90	54.90	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	54.90

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.15	
Patio Door	Patio Door	Brickwork	South	6.50	
S	Window	Brickwork	South	5.45	
NE	Window	Brickwork	North East	2.72	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	22.03	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	14.26	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	8.55	-0.10	-0.10	RCD	No
E2 Other lintels (including other steel lintels)	Independently assessed	7.14	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	23.40	0.02	0.02	RCD	Yes
E18 Party wall between dwellings	Gov Approved Scheme	5.70	0.04	0.04		No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	7.56	0.00	0.02		No
E15 Flat roof with parapet	Table K1 - Default	26.32	0.30	0.30		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	7.56	0.10	0.10	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.30	0.33	0.33	AbbeyCalculated	No

Y-value	0.09	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.19	m³/(h.m²) @ 50 Pa
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	6
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	
28.0 Water Heating		
Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

Summary for Input Data

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-47	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-47
Plot Address	Flat 20, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	75 C	**DER**	7.56	**TER**	17.43
Environmental	95 A	**% DER < TER**			56.63
CO_2 Emissions (t/year)	0.35	**DFEE**	42.69	**TFEE**	48.78
Compliance Check	See BREL	**% DFEE < TFEE**			12.49
% DPER < TPER	16.28	**DPER**	77.80	**TPER**	92.93

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.9000 (1b)	x	2.5500 (2b)	=	139.9950	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9950	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1900	(17)
Infiltration rate		0.1595	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1356	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1729	0.1695	0.1661	0.1491	0.1457	0.1288	0.1288	0.1254	0.1356	0.1457	0.1525	0.1593	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2100	3.3453	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
ColdRoof	54.9000		54.9000	0.0900	4.9410	9.0000	494.1000	(30)
Total net area of external elements Aum(A, m2)			137.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.5554			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.9000			70.0000	3843.0000	(32d)
Internal Wall 1			98.2800			9.0000	884.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15216.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		277.1625 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	22.0300	0.0380	0.8371
E16	Corner (normal)	14.2600	0.0540	0.7700
E17	Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E2	Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4	Jamb	23.4000	0.0160	0.3744
E18	Party wall between dwellings	5.7000	0.0380	0.2166
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5600	0.0000	0.0000
E15	Flat roof with parapet	26.3200	0.3000	7.8960
P4	Party wall - Roof (insulation at ceiling level)	7.5600	0.1010	0.7636
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.8044 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.3598 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	(38)
Heat transfer coeff	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	(39)
Average = Sum(39)m / 12 =												72.4590	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	(40)
HLP (average)												1.3198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8344 (42)
Hot water usage for mixer showers

54.9769	54.1507	52.9467	50.6432	48.9433	47.0476	45.9700	47.1649	48.4746	50.5100	52.8630	54.7662	(42a)

Hot water usage for baths

23.7651	23.4121	22.9151	21.9987	21.3125	20.5516	20.1406	20.6342	21.1715	21.9857	22.9210	23.6847	(42b)

Hot water usage for other uses

33.4164	32.2012	30.9861	29.7710	28.5558	27.3407	27.3407	28.5558	29.7710	30.9861	32.2012	33.4164	(42c)

Average daily hot water use (litres/day) 103.0993 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.1583	109.7641	106.8480	102.4129	98.8116	94.9399	93.4513	96.3548	99.4171	103.4819	107.9853	111.8674	(44)
Energy conte	177.6314	156.3025	164.2213	140.1981	133.0195	116.7396	113.0213	119.3074	122.5912	140.4239	153.8448	175.1572	(45)
Energy content (annual)										Total = Sum(45)m =		1712.4584	
Distribution loss (46)m = 0.15 x (45)m	26.6447	23.4454	24.6332	21.0297	19.9529	17.5109	16.9532	17.8961	18.3887	21.0636	23.0767	26.2736	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)
										Total per year (kWh/year) = Sum(64)m =		2029.7894	(64)
12Total per year (kWh/year)												2030	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.0624	51.9706	54.6036	46.6159	44.2290	38.8159	37.5796	39.6697	40.7616	46.6910	51.1534	58.2398	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.6653	89.3080	80.6653	83.3541	80.6653	83.3541	80.6653	80.6653	83.3541	80.6653	83.3541	80.6653	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.9279	161.5874	157.4054	148.5024	137.2639	126.7014	119.6449	117.9854	122.1674	131.0704	142.3089	152.8714	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)
Water heating gains (Table 5)	79.3850	77.3372	73.3919	64.7443	59.4475	53.9110	50.5102	53.3195	56.6133	62.7567	71.0464	78.2793	(72)
Total internal gains	370.4946	378.7490	361.9790	347.1172	327.8932	314.4829	301.3368	302.4866	312.6512	325.0088	347.2258	362.3324	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	46.7521	0.3300	0.0000	0.7700	77.2180	(78)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
South	5.4500	46.7521	0.3300	0.0000	0.7700	64.7444	(78)

Solar gains	149.7606	248.3714	324.7600	381.6941	411.9394	402.9853	390.9424	368.7080	344.2235	270.1694	178.0861	129.0370	(83)
Total gains	520.2552	627.1204	686.7391	728.8113	739.8326	717.4682	692.2792	671.1945	656.8748	595.1782	525.3119	491.3694	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	
alpha	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	
util living area													
	0.9907	0.9772	0.9528	0.8969	0.7892	0.6170	0.4549	0.4883	0.7013	0.9117	0.9797	0.9929	(86)
MIT	19.7856	20.0318	20.3071	20.6100	20.8427	20.9632	20.9931	20.9903	20.9312	20.6312	20.1389	19.7247	(87)
Th 2	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	(88)
util rest of house													
	0.9875	0.9695	0.9369	0.8626	0.7239	0.5165	0.3365	0.3680	0.6052	0.8745	0.9715	0.9904	(89)
MIT 2	18.4541	18.7631	19.1027	19.4597	19.7059	19.8073	19.8236	19.8226	19.7865	19.4934	18.9016	18.3771	(90)
Living area fraction										fLA = Living area / (4) =		0.4452	(91)
MIT	19.0468	19.3279	19.6389	19.9718	20.2120	20.3219	20.3443	20.3424	20.2961	19.9999	19.4524	18.9770	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0468	19.3279	19.6389	19.9718	20.2120	20.3219	20.3443	20.3424	20.2961	19.9999	19.4524	18.9770	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9846	0.9654	0.9339	0.8674	0.7470	0.5605	0.3894	0.4218	0.6458	0.8809	0.9681	0.9879	(94)
Useful gains	512.2270	605.4200	641.3526	632.1921	552.6515	402.1211	269.6053	283.1275	424.2198	524.3142	508.5507	485.4077	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1068.5407	1045.4302	952.0287	802.2503	616.7699	414.6016	271.3046	285.6637	448.9626	681.1074	895.0437	1070.7258	(97)
Space heating kWh													
	413.8974	295.6868	231.1430	122.4419	47.7041	0.0000	0.0000	0.0000	0.0000	116.6542	278.2749	435.4767	(98a)
Space heating requirement - total per year (kWh/year)												1941.2789	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	413.8974	295.6868	231.1430	122.4419	47.7041	0.0000	0.0000	0.0000	0.0000	116.6542	278.2749	435.4767	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1941.2789	
Space heating per m2											(98c) / (4) =	35.3603	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	413.8974	295.6868	231.1430	122.4419	47.7041	0.0000	0.0000	0.0000	0.0000	116.6542	278.2749	435.4767	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	413.8974	295.6868	231.1430	122.4419	47.7041	0.0000	0.0000	0.0000	0.0000	116.6542	278.2749	435.4767	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.0417	55.6655	58.9094	51.2388	49.2946	44.0101	43.1322	45.0693	45.8133	51.5763	55.4440	62.2793	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0172	2.7252	3.0172	2.9199	3.0172	2.9199	3.0172	3.0172	2.9199	3.0172	2.9199	3.0172	(231)
Lighting	16.4181	13.1712	11.8592	8.6886	6.7113	5.4832	6.1223	7.9579	10.3366	13.5622	15.3184	16.8744	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1941.2789	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	625.4744	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.5251	(230a)
Total electricity for the above, kWh/year	35.5251	(231)
Electricity for lighting (calculated in Appendix L)	132.5032	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2734.7816	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1941.2789	0.1560	302.8133	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	625.4744	0.1411	88.2732	(264)
Space and water heating			391.0866	(265)
Pumps, fans and electric keep-hot	35.5251	0.1387	4.9278	(267)
Energy for lighting	132.5032	0.1443	19.1243	(268)
Total CO2, kg/year			415.1387	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.5600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1941.2789	1.5775	3062.3017	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	625.4744	1.5219	951.8840	(278)
Space and water heating			4014.1857	(279)
Pumps, fans and electric keep-hot	35.5251	1.5128	53.7424	(281)
Energy for lighting	132.5032	1.5338	203.2378	(282)
Total Primary energy kWh/year			4271.1659	(286)
Dwelling Primary energy Rate (DPER)			77.8000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.9000 (1b)	x	2.5500 (2b)	=	139.9950 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9950	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1429	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3929	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3339	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4258	0.4174	0.4091	0.3673	0.3590	0.3172	0.3172	0.3089	0.3339	0.3590	0.3757	0.3924	(22b)
Effective ac	0.5906	0.5871	0.5837	0.5675	0.5644	0.5503	0.5503	0.5477	0.5558	0.5644	0.5706	0.5770	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.5800	1.1450	13.2595			(27)
Brickwork	54.4500	11.5800	42.8700	0.1800	7.7166			(29a)
Communal Wall	18.0800	2.1500	15.9300	0.1800	2.8674			(29a)
Stairwell Wall	9.6100		9.6100	0.1800	1.7298			(29a)
ColdRoof	54.9000		54.9000	0.1100	6.0390			(30)
Total net area of external elements Aum(A, m2)			137.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.7623			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 277.1625 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	22.0300	0.0700	1.5421	
E16 Corner (normal)	14.2600	0.0900	1.2834	
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0900	-0.7695	
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570	
E4 Jamb	23.4000	0.0500	1.1700	
E18 Party wall between dwellings	5.7000	0.0600	0.3420	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5600	0.0000	0.0000	
E15 Flat roof with parapet	26.3200	0.5600	14.7392	
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1200	0.9072	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.6574 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 53.4197 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.2865	27.1239	26.9645	26.2159	26.0759	25.4238	25.4238	25.3031	25.6750	26.0759	26.3592	26.6554	(38)
Heat transfer coeff	80.7062	80.5436	80.3843	79.6357	79.4956	78.8436	78.8436	78.7229	79.0947	79.4956	79.7789	80.0752	(39)

Average = Sum(39)m / 12 = 79.6350

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4701	1.4671	1.4642	1.4506	1.4480	1.4361	1.4361	1.4339	1.4407	1.4480	1.4532	1.4586	(40)
HLP (average)												1.4505	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8344 (42)

Hot water usage for mixer showers

54.9769	54.1507	52.9467	50.6432	48.9433	47.0476	45.9700	47.1649	48.4746	50.5100	52.8630	54.7662	(42a)

Hot water usage for baths

23.7651	23.4121	22.9151	21.9987	21.3125	20.5516	20.1406	20.6342	21.1715	21.9857	22.9210	23.6847	(42b)

Hot water usage for other uses

33.4164	32.2012	30.9861	29.7710	28.5558	27.3407	27.3407	28.5558	29.7710	30.9861	32.2012	33.4164	(42c)

Average daily hot water use (litres/day) 103.0993 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.1583	109.7641	106.8480	102.4129	98.8116	94.9399	93.4513	96.3548	99.4171	103.4819	107.9853	111.8674	(44)
Energy conte	177.6314	156.3025	164.2213	140.1981	133.0195	116.7396	113.0213	119.3074	122.5912	140.4239	153.8448	175.1572	(45)
Energy content (annual)										Total = Sum(45)m =		1712.4584	
Distribution loss (46)m = 0.15 x (45)m	26.6447	23.4454	24.6332	21.0297	19.9529	17.5109	16.9532	17.8961	18.3887	21.0636	23.0767	26.2736	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.2263	198.3883	210.8162	185.2900	179.6144	161.8315	159.6162	165.9023	167.6831	187.0188	198.9367	221.7521	(62)
WWHRS -25.1331	-22.2279	-23.2758	-19.2733	-17.9620	-15.3702	-14.4071	-15.3206	-15.9026	-18.7475	-21.2386	-24.6677	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
199.0932	176.1603	187.5404	166.0167	161.6523	146.4613	145.2090	150.5818	151.7804	168.2714	177.6981	197.0844	(64)
									Total per year (kWh/year) = Sum(64)m =		2027.5493	(64)
12Total per year (kWh/year)											2028	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

96.3384	85.6392	91.8795	82.6894	81.5049	74.8894	74.8555	76.9456	76.8351	83.9669	87.2269	95.5157	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8621	89.5258	80.8621	83.5575	80.8621	83.5575	80.8621	80.8621	83.5575	80.8621	83.5575	80.8621	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.9279	161.5874	157.4054	148.5024	137.2639	126.7014	119.6449	117.9854	122.1674	131.0704	142.3089	152.8714	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)
Water heating gains (Table 5)	129.4870	127.4392	123.4940	114.8463	109.5496	104.0131	100.6122	103.4216	106.7154	112.8587	121.1484	128.3813	(72)
Total internal gains	423.7934	432.0690	415.2779	400.4226	381.1920	364.7883	351.6357	352.7854	362.9566	378.3076	400.5312	415.6313	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1500	11.2829	0.6300	0.7000	0.7700	7.4137	(75)
South	9.4300	46.7521	0.6300	0.7000	0.7700	134.7362	(78)

Solar gains	142.1499	235.7539	308.2744	362.3395	391.0710	382.5793	371.1425	350.0196	326.7571	256.4480	169.0367	122.4789	(83)
Total gains	565.9433	667.8229	723.5523	762.7622	772.2630	747.3676	722.7782	702.8050	689.7137	634.7556	569.5679	538.1101	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.3718	52.4775	52.5815	53.0758	53.1693	53.6090	53.6090	53.6912	53.4388	53.1693	52.9805	52.7845	
alpha	4.4915	4.4985	4.5054	4.5384	4.5446	4.5739	4.5739	4.5794	4.5626	4.5446	4.5320	4.5190	
util living area	0.9881	0.9748	0.9523	0.9006	0.8013	0.6342	0.4711	0.5030	0.7133	0.9091	0.9756	0.9904	(86)
MIT	19.6543	19.8975	20.1860	20.5264	20.7937	20.9475	20.9890	20.9852	20.9078	20.5724	20.0533	19.6112	(87)
Th 2	19.7100	19.7123	19.7145	19.7248	19.7267	19.7357	19.7357	19.7374	19.7323	19.7267	19.7228	19.7187	(88)
util rest of house	0.9839	0.9662	0.9357	0.8657	0.7339	0.5262	0.3404	0.3712	0.6118	0.8698	0.9657	0.9870	(89)
MIT 2	18.2060	18.5122	18.8702	19.2817	19.5700	19.7101	19.7331	19.7334	19.6805	19.3456	18.7194	18.1577	(90)
Living area fraction										fLA = Living area / (4) =		0.4452	(91)
MIT	18.8507	19.1289	19.4559	19.8358	20.1147	20.2610	20.2922	20.2907	20.2269	19.8917	19.3132	18.8047	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8507	19.1289	19.4559	19.8358	20.1147	20.2610	20.2922	20.2907	20.2269	19.8917	19.3132	18.8047	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9801	0.9613	0.9316	0.8692	0.7563	0.5731	0.3990	0.4303	0.6540	0.8758	0.9616	0.9836	(94)
Useful gains	554.6908	641.9473	674.0864	662.9978	584.0719	428.3006	288.3746	302.3933	451.1027	555.8976	547.6813	529.2843	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1174.3344	1146.0493	1041.4534	870.8820	668.9347	446.3310	291.1064	306.2833	484.6021	738.6531	974.3581	1169.4773	(97)
Space heating kWh	461.0148	338.7565	273.3210	149.6766	63.1379	0.0000	0.0000	0.0000	0.0000	135.9701	307.2073	476.3036	(98a)
Space heating requirement - total per year (kWh/year)												2205.3879	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	461.0148	338.7565	273.3210	149.6766	63.1379	0.0000	0.0000	0.0000	0.0000	135.9701	307.2073	476.3036	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2205.3879	
Space heating per m2											(98c) / (4) =	40.1710	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	461.0148	338.7565	273.3210	149.6766	63.1379	0.0000	0.0000	0.0000	0.0000	135.9701	307.2073	476.3036	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	499.4743	367.0168	296.1225	162.1632	68.4051	0.0000	0.0000	0.0000	0.0000	147.3132	332.8357	516.0385	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	199.0932	176.1603	187.5404	166.0167	161.6523	146.4613	145.2090	150.5818	151.7804	168.2714	177.6981	197.0844	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8788	85.5010	84.9034	83.8282	82.1382	79.8000	79.8000	79.8000	79.8000	83.5861	85.2756	85.9625	(217)
Fuel for water heating, kWh/month	231.8305	206.0330	220.8869	198.0440	196.8052	183.5354	181.9662	188.6990	190.2010	201.3151	208.3810	229.2679	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8015	13.4788	12.1362	8.8915	6.8680	5.6112	6.2653	8.1438	10.5780	13.8789	15.6762	17.2685	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.8288	-22.0349	-33.3704	-39.6088	-44.5683	-42.3013	-41.8030	-38.5464	-33.1192	-26.1184	-16.7043	-12.6933	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.2673	-11.3311	-22.9898	-35.2203	-47.2429	-47.6981	-47.1197	-39.5733	-28.5964	-16.4109	-7.0997	-4.1457	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2389.3693	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2436.9653	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.5980	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-678.3925	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4369.5401	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2389.3693	0.2100	501.7676	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2436.9653	0.2100	511.7627	(264)
Space and water heating			1013.5303	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.5980	0.1443	19.5710	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-365.6971	0.1335	-48.8129	
PV Unit electricity exported	-312.6954	0.1253	-39.1898	
Total			-88.0027	(269)
Total CO2, kg/year			957.0278	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2389.3693	1.1300	2699.9873	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2436.9653	1.1300	2753.7708	(278)
Space and water heating			5453.7581	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.5980	1.5338	207.9848	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-365.6971	1.4933	-546.0782	
PV Unit electricity exported	-312.6954	0.4600	-143.8452	
Total			-689.9235	(283)
Total Primary energy kWh/year			5101.9203	(286)
Target Primary Energy Rate (TPER)			92.9300	(287)

Full SAP Calculation Printout

Plot Reference	P-47	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-47
Plot Address	Flat 20, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	75 C	**DER**	7.56	**TER**	17.43
Environmental	95 A	**% DER < TER**			56.63
CO_2 Emissions (t/year)	0.35	**DFEE**	42.69	**TFEE**	48.78
Compliance Check	See BREL	**% DFEE < TFEE**			12.49
% DPER < TPER	16.28	**DPER**	77.80	**TPER**	92.93

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.9000 (1b)	x	2.5500 (2b)	=	139.9950	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9950	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1429	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1900	(17)
Infiltration rate		0.3024	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2570	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3277	0.3213	0.3148	0.2827	0.2763	0.2442	0.2442	0.2377	0.2570	0.2763	0.2891	0.3020	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5537	0.5516	0.5496	0.5400	0.5382	0.5298	0.5298	0.5283	0.5330	0.5382	0.5418	0.5456	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2100	3.3453	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
ColdRoof	54.9000		54.9000	0.0900	4.9410	9.0000	494.1000	(30)
Total net area of external elements Aum(A, m2)			137.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5554			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.9000			70.0000	3843.0000	(32d)
Internal Wall 1			98.2800			9.0000	884.5200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15216.2201	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							277.1625	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	22.0300	0.0380	0.8371	
E16 Corner (normal)	14.2600	0.0540	0.7700	
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294	
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570	
E4 Jamb	23.4000	0.0160	0.3744	
E18 Party wall between dwellings	5.7000	0.0380	0.2166	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5600	0.0000	0.0000	
E15 Flat roof with parapet	26.3200	0.3000	7.8960	
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1010	0.7636	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.8044 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	49.3598 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.5795	25.4832	25.3888	24.9454	24.8624	24.4762	24.4762	24.4047	24.6249	24.8624	25.0302	25.2057	(38)
Heat transfer coeff	74.9393	74.8430	74.7486	74.3052	74.2222	73.8360	73.8360	73.7645	73.9847	74.2222	74.3900	74.5655	(39)
Average = Sum(39)m / 12 =												74.3048	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3650	1.3633	1.3615	1.3535	1.3520	1.3449	1.3449	1.3436	1.3476	1.3520	1.3550	1.3582	(40)
HLP (average)												1.3535	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8344 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.7651	23.4121	22.9151	21.9987	21.3125	20.5516	20.1406	20.6342	21.1715	21.9857	22.9210	23.6847	(42b)

Hot water usage for other uses

33.4164	32.2012	30.9861	29.7710	28.5558	27.3407	27.3407	28.5558	29.7710	30.9861	32.2012	33.4164	(42c)

Average daily hot water use (litres/day) 52.4125 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.1815	55.6134	53.9012	51.7697	49.8683	47.8923	47.4813	49.1900	50.9425	52.9718	55.1222	57.1011	(44)
Energy conte	90.5615	79.1927	82.8442	70.8701	67.1323	58.8892	57.4245	60.9075	62.8172	71.8823	78.5317	89.4066	(45)
Energy content (annual)											Total = Sum(45)m =	870.4597	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

76.9772	67.3138	70.4175	60.2396	57.0625	50.0558	48.8108	51.7714	53.3946	61.0999	66.7520	75.9956	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

76.9772	67.3138	70.4175	60.2396	57.0625	50.0558	48.8108	51.7714	53.3946	61.0999	66.7520	75.9956	(64)
									Total per year (kWh/year) = Sum(64)m =		739.8907	(64)
12Total per year (kWh/year)											740	(64)

Electric shower(s)

44.0273	39.2287	42.8362	40.8781	41.6452	39.7254	41.0496	41.6452	40.8781	42.8362	42.0307	44.0273	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							500.8081	(64a)

Heat gains from water heating, kWh/month

30.2511	26.6356	28.3134	25.2794	24.6769	22.4453	22.4651	23.3541	23.5682	25.9840	27.1957	30.0057	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.6653	89.3080	80.6653	83.3541	80.6653	83.3541	80.6653	80.6653	83.3541	80.6653	83.3541	80.6653	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.9279	161.5874	157.4054	148.5024	137.2639	126.7014	119.6449	117.9854	122.1674	131.0704	142.3089	152.8714	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)
Water heating gains (Table 5)	40.6601	39.6363	38.0557	35.1103	33.1679	31.1740	30.1950	31.3900	32.7336	34.9248	37.7718	40.3303	(72)
Total internal gains	331.7697	341.0482	326.6428	317.4832	301.6135	291.7459	281.0217	280.5570	288.7715	297.1769	313.9512	324.3834	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	46.7521	0.3300	0.0000	0.7700	77.2180	(78)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
South	5.4500	46.7521	0.3300	0.0000	0.7700	64.7444	(78)

Solar gains	149.7606	248.3714	324.7600	381.6941	411.9394	402.9853	390.9424	368.7080	344.2235	270.1694	178.0861	129.0370	(83)
Total gains	481.5303	589.4195	651.4029	699.1773	713.5529	694.7312	671.9641	649.2650	632.9950	567.3463	492.0372	453.4204	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.4020	56.4746	56.5459	56.8834	56.9470	57.2448	57.2448	57.3003	57.1297	56.9470	56.8185	56.6848	
alpha	4.7601	4.7650	4.7697	4.7922	4.7965	4.8163	4.8163	4.8200	4.8086	4.7965	4.7879	4.7790	
util living area	0.9934	0.9828	0.9629	0.9131	0.8135	0.6422	0.4758	0.5114	0.7287	0.9273	0.9848	0.9950	(86)
MIT	19.6582	19.9138	20.2070	20.5468	20.8090	20.9540	20.9910	20.9873	20.9143	20.5725	20.0449	19.6074	(87)
Th 2	19.7903	19.7916	19.7929	19.7992	19.8004	19.8058	19.8058	19.8068	19.8037	19.8004	19.7980	19.7955	(88)
util rest of house	0.9911	0.9768	0.9496	0.8821	0.7499	0.5385	0.3508	0.3846	0.6317	0.8944	0.9784	0.9932	(89)
MIT 2	18.6038	18.8562	19.1417	19.4634	19.6854	19.7880	19.8041	19.8041	19.7652	19.4952	18.9928	18.5575	(90)
Living area fraction										fLA = Living area / (4) =		0.4452	(91)
MIT	19.0732	19.3270	19.6159	19.9457	20.1856	20.3070	20.3325	20.3308	20.2768	19.9748	19.4611	19.0249	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0732	19.3270	19.6159	19.9457	20.1856	20.3070	20.3325	20.3308	20.2768	19.9748	19.4611	19.0249	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9892	0.9738	0.9473	0.8864	0.7721	0.5838	0.4068	0.4415	0.6726	0.9000	0.9761	0.9916	(94)
Useful gains	476.3156	573.9910	617.0562	619.7650	550.9523	405.6038	273.3565	286.6290	425.7571	510.6177	480.2641	449.6172	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1107.0951	1079.7611	980.3978	820.7506	629.8188	421.3853	275.5909	289.9551	456.9864	695.8165	919.5459	1105.4233	(97)
Space heating kWh	469.3000	339.8775	270.3261	144.7096	58.6767	0.0000	0.0000	0.0000	0.0000	137.7879	316.2829	487.9197	(98a)
Space heating requirement - total per year (kWh/year)												2224.8804	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	469.3000	339.8775	270.3261	144.7096	58.6767	0.0000	0.0000	0.0000	0.0000	137.7879	316.2829	487.9197	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2224.8804	
Space heating per m2											(98c) / (4) =	40.5261	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	694.0582	546.3863	560.6099	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8739	0.9322	0.9182	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	606.5179	509.3237	514.7523	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	782.8898	757.8711	732.8874	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	126.9878	184.9193	162.2926	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.7469	46.2298	40.5731	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												118.5499	(107)
Energy for space heating												40.5261	(99)
Energy for space cooling												2.1594	(108)
Total												42.6854	(109)
Fabric Energy Efficiency (DFEE)												42.7	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		54.9000 (1b)	x	2.5500 (2b)	=	139.9950 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9950	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1429	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3929	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3339	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4258	0.4174	0.4091	0.3673	0.3590	0.3172	0.3172	0.3089	0.3339	0.3590	0.3757	0.3924	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5906	0.5871	0.5837	0.5675	0.5644	0.5503	0.5503	0.5477	0.5558	0.5644	0.5706	0.5770	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.5800	1.1450	13.2595			(27)
Brickwork	54.4500	11.5800	42.8700	0.1800	7.7166			(29a)
Communal Wall	18.0800	2.1500	15.9300	0.1800	2.8674			(29a)
Stairwell Wall	9.6100		9.6100	0.1800	1.7298			(29a)
ColdRoof	54.9000		54.9000	0.1100	6.0390			(30)
Total net area of external elements Aum(A, m2)			137.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.7623			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	277.1625	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	22.0300	0.0700	1.5421
E16 Corner (normal)	14.2600	0.0900	1.2834
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0900	-0.7695
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0500	1.1700
E18 Party wall between dwellings	5.7000	0.0600	0.3420
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5600	0.0000	0.0000
E15 Flat roof with parapet	26.3200	0.5600	14.7392
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1200	0.9072
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	19.6574	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 53.4197	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.2865	27.1239	26.9645	26.2159	26.0759	25.4238	25.4238	25.3031	25.6750	26.0759	26.3592	26.6554	(38)
Heat transfer coeff													
	80.7062	80.5436	80.3843	79.6357	79.4956	78.8436	78.8436	78.7229	79.0947	79.4956	79.7789	80.0752	(39)
Average = Sum(39)m / 12 =												79.6350	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4701	1.4671	1.4642	1.4506	1.4480	1.4361	1.4361	1.4339	1.4407	1.4480	1.4532	1.4586	(40)
HLP (average)												1.4505	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8344	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	23.7651	23.4121	22.9151	21.9987	21.3125	20.5516	20.1406	20.6342	21.1715	21.9857	22.9210	23.6847	(42b)
Hot water usage for other uses													
	33.4164	32.2012	30.9861	29.7710	28.5558	27.3407	27.3407	28.5558	29.7710	30.9861	32.2012	33.4164	(42c)
Average daily hot water use (litres/day)												52.4125	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	57.1815	55.6134	53.9012	51.7697	49.8683	47.8923	47.4813	49.1900	50.9425	52.9718	55.1222	57.1011	(44)
Energy conte	90.5615	79.1927	82.8442	70.8701	67.1323	58.8892	57.4245	60.9075	62.8172	71.8823	78.5317	89.4066	(45)
Energy content (annual)											Total = Sum(45)m =	870.4597	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	76.9772	67.3138	70.4175	60.2396	57.0625	50.0558	48.8108	51.7714	53.3946	61.0999	66.7520	75.9956	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	76.9772	67.3138	70.4175	60.2396	57.0625	50.0558	48.8108	51.7714	53.3946	61.0999	66.7520	75.9956	(64)
											Total per year (kWh/year) = Sum(64)m =	739.8907	(64)
12Total per year (kWh/year)												740	(64)
Electric shower(s)													
	44.0273	39.2287	42.8362	40.8781	41.6452	39.7254	41.0496	41.6452	40.8781	42.8362	42.0307	44.0273	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	500.8081	(64a)

Heat gains from water heating, kWh/month

	30.2511	26.6356	28.3134	25.2794	24.6769	22.4453	22.4651	23.3541	23.5682	25.9840	27.1957	30.0057 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	80.8621	89.5258	80.8621	83.5575	80.8621	83.5575	80.8621	80.8621	83.5575	80.8621	83.5575	80.8621	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	159.9279	161.5874	157.4054	148.5024	137.2639	126.7014	119.6449	117.9854	122.1674	131.0704	142.3089	152.8714	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)

Water heating gains (Table 5)

	40.6601	39.6363	38.0557	35.1103	33.1679	31.1740	30.1950	31.3900	32.7336	34.9248	37.7718	40.3303	(72)

Total internal gains

	331.9665	341.2661	326.8396	317.6866	301.8103	291.9493	281.2185	280.7538	288.9749	297.3737	314.1545	324.5802	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1500	11.2829	0.6300	0.7000	0.7700	7.4137	(75)
South	9.4300	46.7521	0.6300	0.7000	0.7700	134.7362	(78)

Solar gains	142.1499	235.7539	308.2744	362.3395	391.0710	382.5793	371.1425	350.0196	326.7571	256.4480	169.0367	122.4789	(83)
Total gains	474.1164	577.0200	635.1140	680.0261	692.8813	674.5286	652.3610	630.7734	615.7320	553.8217	483.1912	447.0591	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.3718	52.4775	52.5815	53.0758	53.1693	53.6090	53.6090	53.6912	53.4388	53.1693	52.9805	52.7845	
alpha	4.4915	4.4985	4.5054	4.5384	4.5446	4.5739	4.5739	4.5794	4.5626	4.5446	4.5320	4.5190	
util living area	0.9940	0.9853	0.9694	0.9292	0.8452	0.6858	0.5175	0.5539	0.7675	0.9401	0.9868	0.9954	(86)
MIT	19.5042	19.7567	20.0607	20.4322	20.7368	20.9279	20.9840	20.9782	20.8745	20.4757	19.9184	19.4609	(87)
Th 2	19.7100	19.7123	19.7145	19.7248	19.7267	19.7357	19.7357	19.7374	19.7323	19.7267	19.7228	19.7187	(88)
util rest of house	0.9918	0.9800	0.9579	0.9016	0.7843	0.5756	0.3762	0.4121	0.6688	0.9107	0.9810	0.9937	(89)
MIT 2	18.3901	18.6408	18.9392	19.2986	19.5646	19.7072	19.7326	19.7326	19.6745	19.3479	18.8108	18.3537	(90)
Living area fraction										fLA = Living area / (4) =		0.4452	(91)
MIT	18.8861	19.1376	19.4385	19.8033	20.0864	20.2506	20.2897	20.2871	20.2087	19.8500	19.3038	18.8466	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8861	19.1376	19.4385	19.8033	20.0864	20.2506	20.2897	20.2871	20.2087	19.8500	19.3038	18.8466	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9769	0.9548	0.9036	0.8035	0.6231	0.4397	0.4759	0.7092	0.9141	0.9785	0.9920	(94)
Useful gains	469.3185	563.6645	606.4165	614.4549	556.7301	420.3316	286.8549	300.1614	436.6892	506.2469	472.8049	443.5011	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1177.1884	1146.7444	1040.0496	868.2883	666.6854	445.5132	290.9095	306.0034	483.1675	735.3336	973.6086	1172.8256	(97)
Space heating kWh	526.6552	391.8297	322.6231	182.7600	81.8067	0.0000	0.0000	0.0000	0.0000	170.4405	360.5787	542.6174	(98a)
Space heating requirement - total per year (kWh/year)												2579.3113	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	526.6552	391.8297	322.6231	182.7600	81.8067	0.0000	0.0000	0.0000	0.0000	170.4405	360.5787	542.6174	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2579.3113	
Space heating per m2											(98c) / (4) =	46.9820	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	741.1298	583.4426	598.2937	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8303	0.9008	0.8837	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	615.3288	525.5941	528.7153	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	759.0558	734.7470	711.0681	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	103.4835	155.6097	135.6704	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	25.8709	38.9024	33.9176	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												98.6909	(107)
Energy for space heating												46.9820	(99)
Energy for space cooling												1.7976	(108)
Total												48.7796	(109)
Fabric Energy Efficiency (TFEE)												48.8	(109)

Full SAP Calculation Printout

Plot Reference	P-47	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-47
Plot Address	Flat 20, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	75 C	**DER**	7.56	**TER**	17.43
Environmental	95 A	**% DER < TER**			56.63
CO_2 Emissions (t/year)	0.35	**DFEE**	42.69	**TFEE**	48.78
Compliance Check	See BREL	**% DFEE < TFEE**			12.49
% DPER < TPER	16.28	**DPER**	77.80	**TPER**	92.93

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.9000 (1b)	x	2.5500 (2b)	=	139.9950	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9950	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1900	(17)
Infiltration rate		0.1595	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1356	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1729	0.1695	0.1661	0.1491	0.1457	0.1288	0.1288	0.1254	0.1356	0.1457	0.1525	0.1593	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2100	3.3453	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
ColdRoof	54.9000		54.9000	0.0900	4.9410	9.0000	494.1000	(30)
Total net area of external elements Aum(A, m2)			137.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.5554			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.9000			70.0000	3843.0000	(32d)
Internal Wall 1			98.2800			9.0000	884.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15216.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		277.1625 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	22.0300	0.0380	0.8371
E16	Corner (normal)	14.2600	0.0540	0.7700
E17	Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E2	Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4	Jamb	23.4000	0.0160	0.3744
E18	Party wall between dwellings	5.7000	0.0380	0.2166
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5600	0.0000	0.0000
E15	Flat roof with parapet	26.3200	0.3000	7.8960
P4	Party wall - Roof (insulation at ceiling level)	7.5600	0.1010	0.7636
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.8044 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.3598 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	(38)
Heat transfer coeff	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	(39)
Average = Sum(39)m / 12 =												72.4590	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	(40)
HLP (average)												1.3198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8344 (42)
Hot water usage for mixer showers

54.9769	54.1507	52.9467	50.6432	48.9433	47.0476	45.9700	47.1649	48.4746	50.5100	52.8630	54.7662	(42a)

Hot water usage for baths

23.7651	23.4121	22.9151	21.9987	21.3125	20.5516	20.1406	20.6342	21.1715	21.9857	22.9210	23.6847	(42b)

Hot water usage for other uses

33.4164	32.2012	30.9861	29.7710	28.5558	27.3407	27.3407	28.5558	29.7710	30.9861	32.2012	33.4164	(42c)

Average daily hot water use (litres/day) 103.0993 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.1583	109.7641	106.8480	102.4129	98.8116	94.9399	93.4513	96.3548	99.4171	103.4819	107.9853	111.8674	(44)
Energy conte	177.6314	156.3025	164.2213	140.1981	133.0195	116.7396	113.0213	119.3074	122.5912	140.4239	153.8448	175.1572	(45)
Energy content (annual)										Total = Sum(45)m =		1712.4584	
Distribution loss (46)m = 0.15 x (45)m	26.6447	23.4454	24.6332	21.0297	19.9529	17.5109	16.9532	17.8961	18.3887	21.0636	23.0767	26.2736	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)
										Total per year (kWh/year) = Sum(64)m =		2029.7894	(64)
12Total per year (kWh/year)												2030	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.0624	51.9706	54.6036	46.6159	44.2290	38.8159	37.5796	39.6697	40.7616	46.6910	51.1534	58.2398	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.6653	89.3080	80.6653	83.3541	80.6653	83.3541	80.6653	80.6653	83.3541	80.6653	83.3541	80.6653	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.9279	161.5874	157.4054	148.5024	137.2639	126.7014	119.6449	117.9854	122.1674	131.0704	142.3089	152.8714	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)
Water heating gains (Table 5)	79.3850	77.3372	73.3919	64.7443	59.4475	53.9110	50.5102	53.3195	56.6133	62.7567	71.0464	78.2793	(72)
Total internal gains	370.4946	378.7490	361.9790	347.1172	327.8932	314.4829	301.3368	302.4866	312.6512	325.0088	347.2258	362.3324	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	46.7521	0.3300	0.0000	0.7700	77.2180	(78)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
South	5.4500	46.7521	0.3300	0.0000	0.7700	64.7444	(78)

Solar gains	149.7606	248.3714	324.7600	381.6941	411.9394	402.9853	390.9424	368.7080	344.2235	270.1694	178.0861	129.0370	(83)
Total gains	520.2552	627.1204	686.7391	728.8113	739.8326	717.4682	692.2792	671.1945	656.8748	595.1782	525.3119	491.3694	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	
alpha	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	
util living area													
	0.9907	0.9772	0.9528	0.8969	0.7892	0.6170	0.4549	0.4883	0.7013	0.9117	0.9797	0.9929	(86)
MIT	19.7856	20.0318	20.3071	20.6100	20.8427	20.9632	20.9931	20.9903	20.9312	20.6312	20.1389	19.7247	(87)
Th 2	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	(88)
util rest of house													
	0.9875	0.9695	0.9369	0.8626	0.7239	0.5165	0.3365	0.3680	0.6052	0.8745	0.9715	0.9904	(89)
MIT 2	18.4541	18.7631	19.1027	19.4597	19.7059	19.8073	19.8236	19.8226	19.7865	19.4934	18.9016	18.3771	(90)
Living area fraction										fLA = Living area / (4) =		0.4452	(91)
MIT	19.0468	19.3279	19.6389	19.9718	20.2120	20.3219	20.3443	20.3424	20.2961	19.9999	19.4524	18.9770	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0468	19.3279	19.6389	19.9718	20.2120	20.3219	20.3443	20.3424	20.2961	19.9999	19.4524	18.9770	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9846	0.9654	0.9339	0.8674	0.7470	0.5605	0.3894	0.4218	0.6458	0.8809	0.9681	0.9879	(94)
Useful gains	512.2270	605.4200	641.3526	632.1921	552.6515	402.1211	269.6053	283.1275	424.2198	524.3142	508.5507	485.4077	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1068.5407	1045.4302	952.0287	802.2503	616.7699	414.6016	271.3046	285.6637	448.9626	681.1074	895.0437	1070.7258	(97)
Space heating kWh													
	413.8974	295.6868	231.1430	122.4419	47.7041	0.0000	0.0000	0.0000	0.0000	116.6542	278.2749	435.4767	(98a)
Space heating requirement - total per year (kWh/year)												1941.2789	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	413.8974	295.6868	231.1430	122.4419	47.7041	0.0000	0.0000	0.0000	0.0000	116.6542	278.2749	435.4767	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1941.2789	
Space heating per m2											(98c) / (4) =	35.3603	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	413.8974	295.6868	231.1430	122.4419	47.7041	0.0000	0.0000	0.0000	0.0000	116.6542	278.2749	435.4767	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	413.8974	295.6868	231.1430	122.4419	47.7041	0.0000	0.0000	0.0000	0.0000	116.6542	278.2749	435.4767	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.0417	55.6655	58.9094	51.2388	49.2946	44.0101	43.1322	45.0693	45.8133	51.5763	55.4440	62.2793	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0172	2.7252	3.0172	2.9199	3.0172	2.9199	3.0172	3.0172	2.9199	3.0172	2.9199	3.0172	(231)
Lighting	16.4181	13.1712	11.8592	8.6886	6.7113	5.4832	6.1223	7.9579	10.3366	13.5622	15.3184	16.8744	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1941.2789	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	625.4744	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.5251	(230a)
Total electricity for the above, kWh/year	35.5251	(231)
Electricity for lighting (calculated in Appendix L)	132.5032	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2734.7816	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1941.2789	0.1560	302.8133	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	625.4744	0.1411	88.2732	(264)
Space and water heating			391.0866	(265)
Pumps, fans and electric keep-hot	35.5251	0.1387	4.9278	(267)
Energy for lighting	132.5032	0.1443	19.1243	(268)
Total CO2, kg/year			415.1387	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.5600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1941.2789	1.5775	3062.3017	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	625.4744	1.5219	951.8840	(278)
Space and water heating			4014.1857	(279)
Pumps, fans and electric keep-hot	35.5251	1.5128	53.7424	(281)
Energy for lighting	132.5032	1.5338	203.2378	(282)
Total Primary energy kWh/year			4271.1659	(286)
Dwelling Primary energy Rate (DPER)			77.8000	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.9000 (1b)	x	2.5500 (2b)	=	139.9950 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9950	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1429	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3929	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3339	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4258	0.4174	0.4091	0.3673	0.3590	0.3172	0.3172	0.3089	0.3339	0.3590	0.3757	0.3924	(22b)
Effective ac	0.5906	0.5871	0.5837	0.5675	0.5644	0.5503	0.5503	0.5477	0.5558	0.5644	0.5706	0.5770	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			11.5800	1.1450	13.2595			(27)
Brickwork	54.4500	11.5800	42.8700	0.1800	7.7166			(29a)
Communal Wall	18.0800	2.1500	15.9300	0.1800	2.8674			(29a)
Stairwell Wall	9.6100		9.6100	0.1800	1.7298			(29a)
ColdRoof	54.9000		54.9000	0.1100	6.0390			(30)
Total net area of external elements Aum(A, m2)			137.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.7623			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 277.1625 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	22.0300	0.0700	1.5421	
E16 Corner (normal)	14.2600	0.0900	1.2834	
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0900	-0.7695	
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570	
E4 Jamb	23.4000	0.0500	1.1700	
E18 Party wall between dwellings	5.7000	0.0600	0.3420	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5600	0.0000	0.0000	
E15 Flat roof with parapet	26.3200	0.5600	14.7392	
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1200	0.9072	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.0200	0.0860	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.6574 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 53.4197 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.2865	27.1239	26.9645	26.2159	26.0759	25.4238	25.4238	25.3031	25.6750	26.0759	26.3592	26.6554	(38)
Heat transfer coeff	80.7062	80.5436	80.3843	79.6357	79.4956	78.8436	78.8436	78.7229	79.0947	79.4956	79.7789	80.0752	(39)

Average = Sum(39)m / 12 = 79.6350

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4701	1.4671	1.4642	1.4506	1.4480	1.4361	1.4361	1.4339	1.4407	1.4480	1.4532	1.4586	(40)
HLP (average)												1.4505	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8344 (42)

Hot water usage for mixer showers

54.9769	54.1507	52.9467	50.6432	48.9433	47.0476	45.9700	47.1649	48.4746	50.5100	52.8630	54.7662	(42a)

Hot water usage for baths

23.7651	23.4121	22.9151	21.9987	21.3125	20.5516	20.1406	20.6342	21.1715	21.9857	22.9210	23.6847	(42b)

Hot water usage for other uses

33.4164	32.2012	30.9861	29.7710	28.5558	27.3407	27.3407	28.5558	29.7710	30.9861	32.2012	33.4164	(42c)

Average daily hot water use (litres/day) 103.0993 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.1583	109.7641	106.8480	102.4129	98.8116	94.9399	93.4513	96.3548	99.4171	103.4819	107.9853	111.8674	(44)
Energy conte	177.6314	156.3025	164.2213	140.1981	133.0195	116.7396	113.0213	119.3074	122.5912	140.4239	153.8448	175.1572	(45)
Energy content (annual)										Total = Sum(45)m =		1712.4584	
Distribution loss (46)m = 0.15 x (45)m	26.6447	23.4454	24.6332	21.0297	19.9529	17.5109	16.9532	17.8961	18.3887	21.0636	23.0767	26.2736	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

224.2263	198.3883	210.8162	185.2900	179.6144	161.8315	159.6162	165.9023	167.6831	187.0188	198.9367	221.7521	(62)
WWHRS -25.1331	-22.2279	-23.2758	-19.2733	-17.9620	-15.3702	-14.4071	-15.3206	-15.9026	-18.7475	-21.2386	-24.6677	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
199.0932	176.1603	187.5404	166.0167	161.6523	146.4613	145.2090	150.5818	151.7804	168.2714	177.6981	197.0844	(64)
									Total per year (kWh/year) = Sum(64)m =		2027.5493	(64)
12Total per year (kWh/year)											2028	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

96.3384	85.6392	91.8795	82.6894	81.5049	74.8894	74.8555	76.9456	76.8351	83.9669	87.2269	95.5157	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.8621	89.5258	80.8621	83.5575	80.8621	83.5575	80.8621	80.8621	83.5575	80.8621	83.5575	80.8621	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.9279	161.5874	157.4054	148.5024	137.2639	126.7014	119.6449	117.9854	122.1674	131.0704	142.3089	152.8714	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)
Water heating gains (Table 5)	129.4870	127.4392	123.4940	114.8463	109.5496	104.0131	100.6122	103.4216	106.7154	112.8587	121.1484	128.3813	(72)
Total internal gains	423.7934	432.0690	415.2779	400.4226	381.1920	364.7883	351.6357	352.7854	362.9566	378.3076	400.5312	415.6313	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	2.1500	11.2829	0.6300	0.7000	0.7700	7.4137	(75)
South	9.4300	46.7521	0.6300	0.7000	0.7700	134.7362	(78)

Solar gains	142.1499	235.7539	308.2744	362.3395	391.0710	382.5793	371.1425	350.0196	326.7571	256.4480	169.0367	122.4789	(83)
Total gains	565.9433	667.8229	723.5523	762.7622	772.2630	747.3676	722.7782	702.8050	689.7137	634.7556	569.5679	538.1101	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.3718	52.4775	52.5815	53.0758	53.1693	53.6090	53.6090	53.6912	53.4388	53.1693	52.9805	52.7845	
alpha	4.4915	4.4985	4.5054	4.5384	4.5446	4.5739	4.5739	4.5794	4.5626	4.5446	4.5320	4.5190	
util living area	0.9881	0.9748	0.9523	0.9006	0.8013	0.6342	0.4711	0.5030	0.7133	0.9091	0.9756	0.9904	(86)
MIT	19.6543	19.8975	20.1860	20.5264	20.7937	20.9475	20.9890	20.9852	20.9078	20.5724	20.0533	19.6112	(87)
Th 2	19.7100	19.7123	19.7145	19.7248	19.7267	19.7357	19.7357	19.7374	19.7323	19.7267	19.7228	19.7187	(88)
util rest of house	0.9839	0.9662	0.9357	0.8657	0.7339	0.5262	0.3404	0.3712	0.6118	0.8698	0.9657	0.9870	(89)
MIT 2	18.2060	18.5122	18.8702	19.2817	19.5700	19.7101	19.7331	19.7334	19.6805	19.3456	18.7194	18.1577	(90)
Living area fraction										fLA = Living area / (4) =		0.4452	(91)
MIT	18.8507	19.1289	19.4559	19.8358	20.1147	20.2610	20.2922	20.2907	20.2269	19.8917	19.3132	18.8047	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8507	19.1289	19.4559	19.8358	20.1147	20.2610	20.2922	20.2907	20.2269	19.8917	19.3132	18.8047	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9801	0.9613	0.9316	0.8692	0.7563	0.5731	0.3990	0.4303	0.6540	0.8758	0.9616	0.9836	(94)
Useful gains	554.6908	641.9473	674.0864	662.9978	584.0719	428.3006	288.3746	302.3933	451.1027	555.8976	547.6813	529.2843	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1174.3344	1146.0493	1041.4534	870.8820	668.9347	446.3310	291.1064	306.2833	484.6021	738.6531	974.3581	1169.4773	(97)
Space heating kWh	461.0148	338.7565	273.3210	149.6766	63.1379	0.0000	0.0000	0.0000	0.0000	135.9701	307.2073	476.3036	(98a)
Space heating requirement - total per year (kWh/year)												2205.3879	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	461.0148	338.7565	273.3210	149.6766	63.1379	0.0000	0.0000	0.0000	0.0000	135.9701	307.2073	476.3036	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2205.3879	
Space heating per m2											(98c) / (4) =	40.1710	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	461.0148	338.7565	273.3210	149.6766	63.1379	0.0000	0.0000	0.0000	0.0000	135.9701	307.2073	476.3036	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	499.4743	367.0168	296.1225	162.1632	68.4051	0.0000	0.0000	0.0000	0.0000	147.3132	332.8357	516.0385	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	199.0932	176.1603	187.5404	166.0167	161.6523	146.4613	145.2090	150.5818	151.7804	168.2714	177.6981	197.0844	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8788	85.5010	84.9034	83.8282	82.1382	79.8000	79.8000	79.8000	79.8000	83.5861	85.2756	85.9625	(217)
Fuel for water heating, kWh/month	231.8305	206.0330	220.8869	198.0440	196.8052	183.5354	181.9662	188.6990	190.2010	201.3151	208.3810	229.2679	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.8015	13.4788	12.1362	8.8915	6.8680	5.6112	6.2653	8.1438	10.5780	13.8789	15.6762	17.2685	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.8288	-22.0349	-33.3704	-39.6088	-44.5683	-42.3013	-41.8030	-38.5464	-33.1192	-26.1184	-16.7043	-12.6933	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.2673	-11.3311	-22.9898	-35.2203	-47.2429	-47.6981	-47.1197	-39.5733	-28.5964	-16.4109	-7.0997	-4.1457	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2389.3693	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2436.9653	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	135.5980	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-678.3925	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4369.5401	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2389.3693	0.2100	501.7676	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2436.9653	0.2100	511.7627	(264)
Space and water heating			1013.5303	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.5980	0.1443	19.5710	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-365.6971	0.1335	-48.8129	
PV Unit electricity exported	-312.6954	0.1253	-39.1898	
Total			-88.0027	(269)
Total CO2, kg/year			957.0278	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2389.3693	1.1300	2699.9873	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2436.9653	1.1300	2753.7708	(278)
Space and water heating			5453.7581	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.5980	1.5338	207.9848	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-365.6971	1.4933	-546.0782	
PV Unit electricity exported	-312.6954	0.4600	-143.8452	
Total			-689.9235	(283)
Total Primary energy kWh/year			5101.9203	(286)
Target Primary Energy Rate (TPER)			92.9300	(287)

Full SAP Calculation Printout

Plot Reference	P-47	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-47
Plot Address	Flat 20, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	75 C	**DER**	7.56	**TER**	17.43
Environmental	95 A	**% DER < TER**			56.63
CO_2 Emissions (t/year)	0.35	**DFEE**	42.69	**TFEE**	48.78
Compliance Check	See BREL	**% DFEE < TFEE**			12.49
% DPER < TPER	16.28	**DPER**	77.80	**TPER**	92.93

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.9000	(1b)	x 2.5500	(2b) =	139.9950	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9950	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.1900 (17)
Infiltration rate		0.1595 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1729	0.1695	0.1661	0.1491	0.1457	0.1288	0.1288	0.1254	0.1356	0.1457	0.1525	0.1593	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2100	3.3453	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
ColdRoof	54.9000		54.9000	0.0900	4.9410	9.0000	494.1000	(30)
Total net area of external elements Aum(A, m2)			137.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.5554			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.9000			70.0000	3843.0000	(32d)
Internal Wall 1			98.2800			9.0000	884.5200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15216.2201	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							277.1625	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.0300	0.0380	0.8371
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5600	0.0000	0.0000
E15 Flat roof with parapet	26.3200	0.3000	7.8960
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1010	0.7636
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.8044 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.3598 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	(38)
Heat transfer coeff	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	(39)
Average = Sum(39)m / 12 =												72.4590	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	(40)
HLP (average)												1.3198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8344 (42)
Hot water usage for mixer showers

54.9769	54.1507	52.9467	50.6432	48.9433	47.0476	45.9700	47.1649	48.4746	50.5100	52.8630	54.7662	(42a)

Hot water usage for baths

23.7651	23.4121	22.9151	21.9987	21.3125	20.5516	20.1406	20.6342	21.1715	21.9857	22.9210	23.6847	(42b)

Hot water usage for other uses

33.4164	32.2012	30.9861	29.7710	28.5558	27.3407	27.3407	28.5558	29.7710	30.9861	32.2012	33.4164	(42c)

Average daily hot water use (litres/day) 103.0993 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.1583	109.7641	106.8480	102.4129	98.8116	94.9399	93.4513	96.3548	99.4171	103.4819	107.9853	111.8674	(44)
Energy conte	177.6314	156.3025	164.2213	140.1981	133.0195	116.7396	113.0213	119.3074	122.5912	140.4239	153.8448	175.1572	(45)
Energy content (annual)										Total = Sum(45)m =		1712.4584	
Distribution loss (46)m = 0.15 x (45)m	26.6447	23.4454	24.6332	21.0297	19.9529	17.5109	16.9532	17.8961	18.3887	21.0636	23.0767	26.2736	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)
										Total per year (kWh/year) = Sum(64)m =		2029.7894	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	59.0624	51.9706	54.6036	46.6159	44.2290	38.8159	37.5796	39.6697	40.7616	46.6910	51.1534	58.2398	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7572	16.6600	13.5488	10.2573	7.6675	6.4732	6.9945	9.0917	12.2029	15.4944	18.0843	19.2785	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.6983	241.1753	234.9335	221.6454	204.8716	189.1065	178.5745	176.0976	182.3394	195.6275	212.4013	228.1663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)
Water heating gains (Table 5)	79.3850	77.3372	73.3919	64.7443	59.4475	53.9110	50.5102	53.3195	56.6133	62.7567	71.0464	78.2793	(72)
Total internal gains	421.3701	419.7020	406.4038	381.1766	356.5161	334.0203	320.6088	323.0384	335.6852	358.4081	386.0615	410.2537	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	46.7521	0.3300	0.0000	0.7700	77.2180	(78)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
South	5.4500	46.7521	0.3300	0.0000	0.7700	64.7444	(78)

Solar gains	149.7606	248.3714	324.7600	381.6941	411.9394	402.9853	390.9424	368.7080	344.2235	270.1694	178.0861	129.0370	(83)
Total gains	571.1307	668.0734	731.1638	762.8706	768.4556	737.0056	711.5512	691.7464	679.9087	628.5776	564.1476	539.2907	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	
alpha	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	
util living area	0.9864	0.9709	0.9414	0.8824	0.7715	0.6033	0.4431	0.4747	0.6836	0.8959	0.9733	0.9895	(86)
MIT	19.8693	20.0944	20.3665	20.6440	20.8583	20.9666	20.9939	20.9914	20.9385	20.6670	20.1990	19.8047	(87)
Th 2	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	(88)
util rest of house	0.9818	0.9615	0.9226	0.8452	0.7046	0.5039	0.3275	0.3573	0.5877	0.8547	0.9628	0.9859	(89)
MIT 2	18.5595	18.8401	19.1726	19.4958	19.7192	19.8091	19.8238	19.8229	19.7910	19.5309	18.9753	18.4781	(90)
Living area fraction										fLA = Living area / (4) =		0.4452	(91)
MIT	19.1426	19.3985	19.7041	20.0070	20.2263	20.3244	20.3447	20.3431	20.3018	20.0367	19.5201	19.0687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1426	19.3985	19.7041	20.0070	20.2263	20.3244	20.3447	20.3431	20.3018	20.0367	19.5201	19.0687	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9782	0.9572	0.9203	0.8516	0.7290	0.5475	0.3792	0.4098	0.6285	0.8631	0.9594	0.9828	(94)
Useful gains	558.6953	639.4835	672.9061	649.6624	560.1906	403.4857	269.8243	283.4766	427.3319	542.5435	541.2195	529.9915	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1075.4798	1050.5476	956.7538	804.7987	617.8094	414.7830	271.3361	285.7129	449.3793	683.7723	899.9451	1077.3682	(97)
Space heating kWh	384.4877	276.2350	211.1827	111.6981	42.8684	0.0000	0.0000	0.0000	0.0000	105.0742	258.2824	407.2482	(98a)
Space heating requirement - total per year (kWh/year)												1797.0768	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	384.4877	276.2350	211.1827	111.6981	42.8684	0.0000	0.0000	0.0000	0.0000	105.0742	258.2824	407.2482	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1797.0768	
Space heating per m2											(98c) / (4) =	32.7336	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	384.4877	276.2350	211.1827	111.6981	42.8684	0.0000	0.0000	0.0000	0.0000	105.0742	258.2824	407.2482	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	384.4877	276.2350	211.1827	111.6981	42.8684	0.0000	0.0000	0.0000	0.0000	105.0742	258.2824	407.2482	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.0417	55.6655	58.9094	51.2388	49.2946	44.0101	43.1322	45.0693	45.8133	51.5763	55.4440	62.2793	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0172	2.7252	3.0172	2.9199	3.0172	2.9199	3.0172	3.0172	2.9199	3.0172	2.9199	3.0172	(231)
Lighting	16.4181	13.1712	11.8592	8.6886	6.7113	5.4832	6.1223	7.9579	10.3366	13.5622	15.3184	16.8744	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1797.0768	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												625.4744	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.5251	(230a)
Total electricity for the above, kWh/year	35.5251	(231)
Electricity for lighting (calculated in Appendix L)	132.5032	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2590.5795	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1797.0768	16.4900	296.3380	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	625.4744	16.4900	103.1407	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	35.5251	16.4900	5.8581	(249)
Energy for lighting	132.5032	16.4900	21.8498	(250)
Additional standing charges			0.0000	(251)
Total energy cost			427.1866	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.5394	(257)
SAP value		75.0461	
SAP rating (Section 12)		75	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1797.0768	0.1561	280.4837	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	625.4744	0.1411	88.2732	(264)
Space and water heating			368.7570	(265)
Pumps, fans and electric keep-hot	35.5251	0.1387	4.9278	(267)
Energy for lighting	132.5032	0.1443	19.1243	(268)
Total CO2, kg/year			392.8090	(272)
CO2 emissions per m2			7.1500	(273)
EI value			94.7311	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.9000	(1b)	x 2.5500	(2b) =	139.9950	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		139.9950	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50												3.1900	(17)
Infiltration rate												0.1595	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1356	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1457	0.1390	0.1390	0.1288	0.1322	0.1152	0.1152	0.1118	0.1152	0.1288	0.1254	0.1356	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2100	3.3453	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
ColdRoof	54.9000		54.9000	0.0900	4.9410	9.0000	494.1000	(30)
Total net area of external elements Aum(A, m2)			137.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5554			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.9000			70.0000	3843.0000	(32d)
Internal Wall 1			98.2800			9.0000	884.5200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15216.2201	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		277.1625	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	22.0300	0.0380	0.8371
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5600	0.0000	0.0000
E15 Flat roof with parapet	26.3200	0.3000	7.8960
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1010	0.7636
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.8044	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	49.3598	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	(38)
Heat transfer coeff	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	(39)
Average = Sum(39)m / 12 =												72.4590	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	(40)
HLP (average)												1.3198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8344	(42)
Hot water usage for mixer showers	54.9769	54.1507	52.9467	50.6432	48.9433	47.0476	45.9700	47.1649	48.4746	50.5100	52.8630	54.7662	(42a)
Hot water usage for baths	23.7651	23.4121	22.9151	21.9987	21.3125	20.5516	20.1406	20.6342	21.1715	21.9857	22.9210	23.6847	(42b)
Hot water usage for other uses	33.4164	32.2012	30.9861	29.7710	28.5558	27.3407	27.3407	28.5558	29.7710	30.9861	32.2012	33.4164	(42c)
Average daily hot water use (litres/day)												103.0993	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.1583	109.7641	106.8480	102.4129	98.8116	94.9399	93.4513	96.3548	99.4171	103.4819	107.9853	111.8674	(44)
Energy conte	177.6314	156.3025	164.2213	140.1981	133.0195	116.7396	113.0213	119.3074	122.5912	140.4239	153.8448	175.1572	(45)
Energy content (annual)										Total = Sum(45)m =		1712.4584	
Distribution loss (46)m = 0.15 x (45)m	26.6447	23.4454	24.6332	21.0297	19.9529	17.5109	16.9532	17.8961	18.3887	21.0636	23.0767	26.2736	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)

											Total per year (kWh/year) = Sum(64)m =	2029.7894	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
59.0624	51.9706	54.6036	46.6159	44.2290	38.8159	37.5796	39.6697	40.7616	46.6910	51.1534	58.2398		(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.7572	16.6600	13.5488	10.2573	7.6675	6.4732	6.9945	9.0917	12.2029	15.4944	18.0843	19.2785	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	238.6983	241.1753	234.9335	221.6454	204.8716	189.1065	178.5745	176.0976	182.3394	195.6275	212.4013	228.1663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)
Water heating gains (Table 5)													
	79.3850	77.3372	73.3919	64.7443	59.4475	53.9110	50.5102	53.3195	56.6133	62.7567	71.0464	78.2793	(72)
Total internal gains													
	421.3701	419.7020	406.4038	381.1766	356.5161	334.0203	320.6088	323.0384	335.6852	358.4081	386.0615	410.2537	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	54.2217	0.3300	0.0000	0.7700	89.5553	(78)
Northeast	2.7200	13.7804	0.3300	0.0000	0.7700	9.5244	(75)
South	5.4500	54.2217	0.3300	0.0000	0.7700	75.0887	(78)

Solar gains	174.1683	251.9864	327.2374	392.7209	416.1135	432.3154	414.5296	398.1281	370.3480	294.1000	203.9051	151.0338	(83)
Total gains	595.5384	671.6884	733.6411	773.8974	772.6297	766.3358	735.1384	721.1665	706.0332	652.5081	589.9667	561.2875	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	
alpha	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	
util living area													
	0.9804	0.9641	0.9267	0.8458	0.7003	0.4838	0.3244	0.3404	0.5923	0.8516	0.9595	0.9845	(86)
MIT	20.0066	20.1939	20.4658	20.7382	20.9198	20.9894	20.9988	20.9985	20.9710	20.7680	20.3428	19.9519	(87)
Th 2	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	(88)
util rest of house													
	0.9736	0.9521	0.9029	0.7984	0.6195	0.3785	0.2094	0.2235	0.4870	0.7960	0.9435	0.9790	(89)
MIT 2	18.7324	18.9639	19.2915	19.5980	19.7734	19.8217	19.8252	19.8251	19.8124	19.6373	19.1518	18.6644	(90)
Living area fraction										fLA = Living area / (4) =		0.4452	(91)
MIT	19.2996	19.5115	19.8143	20.1056	20.2837	20.3415	20.3477	20.3475	20.3282	20.1406	19.6820	19.2376	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2996	19.5115	19.8143	20.1056	20.2837	20.3415	20.3477	20.3475	20.3282	20.1406	19.6820	19.2376	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9697	0.9482	0.9026	0.8108	0.6526	0.4255	0.2607	0.2757	0.5335	0.8126	0.9411	0.9754	(94)
Useful gains	577.5003	636.9208	662.1862	627.4513	504.1882	326.0433	191.6481	198.8139	376.6577	530.2194	555.2125	547.4905	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
1028.8904	1000.7670	899.5244	739.4867	535.0181	329.0759	191.8474	199.0806	386.0746	626.0926	846.4653	1024.3930		(97)
Space heating kWh													
335.8342	244.5046	176.5797	80.6655	22.9375	0.0000	0.0000	0.0000	0.0000	71.3296	209.7020	354.8154		(98a)
Space heating requirement - total per year (kWh/year)												1496.3685	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
335.8342	244.5046	176.5797	80.6655	22.9375	0.0000	0.0000	0.0000	0.0000	71.3296	209.7020	354.8154		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1496.3685	
Space heating per m2											(98c) / (4) =	27.2563	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	335.8342	244.5046	176.5797	80.6655	22.9375	0.0000	0.0000	0.0000	0.0000	71.3296	209.7020	354.8154	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)

335.8342	244.5046	176.5797	80.6655	22.9375	0.0000	0.0000	0.0000	0.0000	71.3296	209.7020	354.8154	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)

Efficiency of water heater 324.5200 (216)

(217)m 324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)

Fuel for water heating, kWh/month

63.0417	55.6655	58.9094	51.2388	49.2946	44.0101	43.1322	45.0693	45.8133	51.5763	55.4440	62.2793	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 3.0172	2.7252	3.0172	2.9199	3.0172	2.9199	3.0172	3.0172	2.9199	3.0172	2.9199	3.0172	(231)
Lighting 16.4181	13.1712	11.8592	8.6886	6.7113	5.4832	6.1223	7.9579	10.3366	13.5622	15.3184	16.8744	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	1496.3685	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	625.4744	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.5251	(230a)
Total electricity for the above, kWh/year	35.5251	(231)
Electricity for lighting (calculated in Appendix L)	132.5032	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2289.8712	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1496.3685	27.6700	414.0452	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	625.4744	27.6700	173.0688	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	35.5251	27.6700	9.8298	(249)
Energy for lighting	132.5032	27.6700	36.6636	(250)
Additional standing charges			0.0000	(251)
Total energy cost			633.6074	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1496.3685	0.1568	234.6421	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	625.4744	0.1411	88.2732	(264)
Space and water heating			322.9153	(265)
Pumps, fans and electric keep-hot	35.5251	0.1387	4.9278	(267)
Energy for lighting	132.5032	0.1443	19.1243	(268)
Total CO2, kg/year			346.9674	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1496.3685	1.5805	2365.0248	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	625.4744	1.5219	951.8840	(278)
Space and water heating			3316.9088	(279)
Pumps, fans and electric keep-hot	35.5251	1.5128	53.7424	(281)
Energy for lighting	132.5032	1.5338	203.2378	(282)
Total Primary energy kWh/year			3573.8890	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 75
Current environmental impact rating: A 95

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: C 75
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£634	£634	£0
Space heating	£424	£424	£0
Water heating	£173	£173	£0
Lighting	£37	£37	£0
Total cost of fuels	£634	£634	£0
Total cost of uses	£634	£634	£0
Delivered energy	42 kWh/m²	42 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	65 kWh/m²	65 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.9000 (1b)	x	2.5500 (2b)	=	139.9950	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.9950	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.1900	(17)
Infiltration rate		0.1595	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1356	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1729	0.1695	0.1661	0.1491	0.1457	0.1288	0.1288	0.1254	0.1356	0.1457	0.1525	0.1593	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2100	3.3453	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
ColdRoof	54.9000		54.9000	0.0900	4.9410	9.0000	494.1000	(30)
Total net area of external elements Aum(A, m2)			137.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5554			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.9000			70.0000	3843.0000	(32d)
Internal Wall 1			98.2800			9.0000	884.5200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15216.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 277.1625 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.0300	0.0380	0.8371
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5600	0.0000	0.0000
E15 Flat roof with parapet	26.3200	0.3000	7.8960
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1010	0.7636
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.8044 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.3598 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	(38)
Heat transfer coeff	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	(39)
Average = Sum(39)m / 12 =												72.4590	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	(40)
HLP (average)												1.3198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8344 (42)
Hot water usage for mixer showers

54.9769	54.1507	52.9467	50.6432	48.9433	47.0476	45.9700	47.1649	48.4746	50.5100	52.8630	54.7662	(42a)

Hot water usage for baths

23.7651	23.4121	22.9151	21.9987	21.3125	20.5516	20.1406	20.6342	21.1715	21.9857	22.9210	23.6847	(42b)

Hot water usage for other uses

33.4164	32.2012	30.9861	29.7710	28.5558	27.3407	27.3407	28.5558	29.7710	30.9861	32.2012	33.4164	(42c)

Average daily hot water use (litres/day) 103.0993 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.1583	109.7641	106.8480	102.4129	98.8116	94.9399	93.4513	96.3548	99.4171	103.4819	107.9853	111.8674	(44)
Energy conte	177.6314	156.3025	164.2213	140.1981	133.0195	116.7396	113.0213	119.3074	122.5912	140.4239	153.8448	175.1572	(45)
Energy content (annual)										Total = Sum(45)m =		1712.4584	
Distribution loss (46)m = 0.15 x (45)m	26.6447	23.4454	24.6332	21.0297	19.9529	17.5109	16.9532	17.8961	18.3887	21.0636	23.0767	26.2736	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)

Total per year (kWh/year) = Sum(64)m = 2029.7894 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

59.0624	51.9706	54.6036	46.6159	44.2290	38.8159	37.5796	39.6697	40.7616	46.6910	51.1534	58.2398	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7572	16.6600	13.5488	10.2573	7.6675	6.4732	6.9945	9.0917	12.2029	15.4944	18.0843	19.2785	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	238.6983	241.1753	234.9335	221.6454	204.8716	189.1065	178.5745	176.0976	182.3394	195.6275	212.4013	228.1663 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772 (71)
Water heating gains (Table 5)												
	79.3850	77.3372	73.3919	64.7443	59.4475	53.9110	50.5102	53.3195	56.6133	62.7567	71.0464	78.2793 (72)
Total internal gains												
	421.3701	419.7020	406.4038	381.1766	356.5161	334.0203	320.6088	323.0384	335.6852	358.4081	386.0615	410.2537 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	46.7521	0.3300	0.0000	0.7700	77.2180	(78)
Northeast	2.7200	11.2829	0.3300	0.0000	0.7700	7.7982	(75)
South	5.4500	46.7521	0.3300	0.0000	0.7700	64.7444	(78)

Solar gains	149.7606	248.3714	324.7600	381.6941	411.9394	402.9853	390.9424	368.7080	344.2235	270.1694	178.0861	129.0370	(83)
Total gains	571.1307	668.0734	731.1638	762.8706	768.4556	737.0056	711.5512	691.7464	679.9087	628.5776	564.1476	539.2907	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	
alpha	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	
util living area	0.9864	0.9709	0.9414	0.8824	0.7715	0.6033	0.4431	0.4747	0.6836	0.8959	0.9733	0.9895	(86)
MIT	19.8693	20.0944	20.3665	20.6440	20.8583	20.9666	20.9939	20.9914	20.9385	20.6670	20.1990	19.8047	(87)
Th 2	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	(88)
util rest of house	0.9818	0.9615	0.9226	0.8452	0.7046	0.5039	0.3275	0.3573	0.5877	0.8547	0.9628	0.9859	(89)
MIT 2	18.5595	18.8401	19.1726	19.4958	19.7192	19.8091	19.8238	19.8229	19.7910	19.5309	18.9753	18.4781	(90)
Living area fraction										fLA = Living area / (4) =		0.4452	(91)
MIT	19.1426	19.3985	19.7041	20.0070	20.2263	20.3244	20.3447	20.3431	20.3018	20.0367	19.5201	19.0687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1426	19.3985	19.7041	20.0070	20.2263	20.3244	20.3447	20.3431	20.3018	20.0367	19.5201	19.0687	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9782	0.9572	0.9203	0.8516	0.7290	0.5475	0.3792	0.4098	0.6285	0.8631	0.9594	0.9828	(94)
Useful gains	558.6953	639.4835	672.9061	649.6624	560.1906	403.4857	269.8243	283.4766	427.3319	542.5435	541.2195	529.9915	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1075.4798	1050.5476	956.7538	804.7987	617.8094	414.7830	271.3361	285.7129	449.3793	683.7723	899.9451	1077.3682	(97)
Space heating kWh	384.4877	276.2350	211.1827	111.6981	42.8684	0.0000	0.0000	0.0000	0.0000	105.0742	258.2824	407.2482	(98a)
Space heating requirement - total per year (kWh/year)												1797.0768	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	384.4877	276.2350	211.1827	111.6981	42.8684	0.0000	0.0000	0.0000	0.0000	105.0742	258.2824	407.2482	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1797.0768	
Space heating per m2											(98c) / (4) =	32.7336	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	384.4877	276.2350	211.1827	111.6981	42.8684	0.0000	0.0000	0.0000	0.0000	105.0742	258.2824	407.2482	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	384.4877	276.2350	211.1827	111.6981	42.8684	0.0000	0.0000	0.0000	0.0000	105.0742	258.2824	407.2482	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)

Water heating

Water heating requirement	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	63.0417	55.6655	58.9094	51.2388	49.2946	44.0101	43.1322	45.0693	45.8133	51.5763	55.4440	62.2793	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0172	2.7252	3.0172	2.9199	3.0172	2.9199	3.0172	3.0172	2.9199	3.0172	2.9199	3.0172	(231)
Lighting	16.4181	13.1712	11.8592	8.6886	6.7113	5.4832	6.1223	7.9579	10.3366	13.5622	15.3184	16.8744	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1797.0768	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	625.4744	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.5251	(230a)
Total electricity for the above, kWh/year	35.5251	(231)
Electricity for lighting (calculated in Appendix L)	132.5032	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2590.5795	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1797.0768	16.4900	296.3380	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	625.4744	16.4900	103.1407	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	35.5251	16.4900	5.8581	(249)
Energy for lighting	132.5032	16.4900	21.8498	(250)
Additional standing charges			0.0000	(251)
Total energy cost			427.1866	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.5394	(257)
SAP value		75.0461	
SAP rating (Section 12)		75	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1797.0768	0.1561	280.4837	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	625.4744	0.1411	88.2732	(264)
Space and water heating			368.7570	(265)
Pumps, fans and electric keep-hot	35.5251	0.1387	4.9278	(267)
Energy for lighting	132.5032	0.1443	19.1243	(268)
Total CO2, kg/year			392.8090	(272)
CO2 emissions per m2			7.1500	(273)
EI value			94.7311	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.9000	(1b) x	2.5500	(2b) =	139.9950	(1b) - (3b)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 54.9000 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 139.9950 (5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.1900 (17)
Infiltration rate		0.1595 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1457	0.1390	0.1390	0.1288	0.1322	0.1152	0.1152	0.1118	0.1152	0.1288	0.1254	0.1356	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			6.5000	1.1450	7.4427			(27)
Window			8.1700	1.1450	9.3550			(27)
Brickwork	54.4500	14.6700	39.7800	0.2100	8.3538	110.0000	4375.8001	(29a)
Communal Wall	18.0800	2.1500	15.9300	0.2100	3.3453	110.0000	1752.3000	(29a)
Stairwell Wall	9.6100		9.6100	0.1600	1.5376	110.0000	1057.1000	(29a)
ColdRoof	54.9000		54.9000	0.0900	4.9410	9.0000	494.1000	(30)
Total net area of external elements Aum(A, m2)			137.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.5554			(33)
Main dwelling								
Party Wall 1			25.5400	0.0000	0.0000	110.0000	2809.4001	(32)
Party Floor 1			54.9000			70.0000	3843.0000	(32d)
Internal Wall 1			98.2800			9.0000	884.5200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15216.2201 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 277.1625 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.0300	0.0380	0.8371
E16 Corner (normal)	14.2600	0.0540	0.7700
E17 Corner (inverted - internal area greater than external area)	8.5500	-0.0970	-0.8294
E2 Other lintels (including other steel lintels)	7.1400	0.0500	0.3570
E4 Jamb	23.4000	0.0160	0.3744
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.5600	0.0000	0.0000
E15 Flat roof with parapet	26.3200	0.3000	7.8960
P4 Party wall - Roof (insulation at ceiling level)	7.5600	0.1010	0.7636
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3000	0.3300	1.4190

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.8044 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.3598 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	23.0992	(38)
Heat transfer coeff	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	72.4590	(39)

Average = Sum(39)m / 12 = 72.4590

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	1.3198	(40)
HLP (average)												1.3198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8344 (42)
Hot water usage for mixer showers
54.9769 54.1507 52.9467 50.6432 48.9433 47.0476 45.9700 47.1649 48.4746 50.5100 52.8630 54.7662 (42a)
Hot water usage for baths
23.7651 23.4121 22.9151 21.9987 21.3125 20.5516 20.1406 20.6342 21.1715 21.9857 22.9210 23.6847 (42b)
Hot water usage for other uses
33.4164 32.2012 30.9861 29.7710 28.5558 27.3407 27.3407 28.5558 29.7710 30.9861 32.2012 33.4164 (42c)
Average daily hot water use (litres/day) 103.0993 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use

	112.1583	109.7641	106.8480	102.4129	98.8116	94.9399	93.4513	96.3548	99.4171	103.4819	107.9853	111.8674	(44)
Energy conte	177.6314	156.3025	164.2213	140.1981	133.0195	116.7396	113.0213	119.3074	122.5912	140.4239	153.8448	175.1572	(45)
Energy content (annual)										Total = Sum(45)m =		1712.4584	
Distribution loss (46)m = 0.15 x (45)m													
	26.6447	23.4454	24.6332	21.0297	19.9529	17.5109	16.9532	17.8961	18.3887	21.0636	23.0767	26.2736	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)
										Total per year (kWh/year) = Sum(64)m =		2029.7894	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	59.0624	51.9706	54.6036	46.6159	44.2290	38.8159	37.5796	39.6697	40.7616	46.6910	51.1534	58.2398	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	110.0657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.7572	16.6600	13.5488	10.2573	7.6675	6.4732	6.9945	9.0917	12.2029	15.4944	18.0843	19.2785	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	238.6983	241.1753	234.9335	221.6454	204.8716	189.1065	178.5745	176.0976	182.3394	195.6275	212.4013	228.1663	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	47.8410	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)
Water heating gains (Table 5)													
	79.3850	77.3372	73.3919	64.7443	59.4475	53.9110	50.5102	53.3195	56.6133	62.7567	71.0464	78.2793	(72)
Total internal gains													
	421.3701	419.7020	406.4038	381.1766	356.5161	334.0203	320.6088	323.0384	335.6852	358.4081	386.0615	410.2537	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5000	54.2217	0.3300	0.0000	0.7700	89.5553	(78)
Northeast	2.7200	13.7804	0.3300	0.0000	0.7700	9.5244	(75)
South	5.4500	54.2217	0.3300	0.0000	0.7700	75.0887	(78)

Solar gains	174.1683	251.9864	327.2374	392.7209	416.1135	432.3154	414.5296	398.1281	370.3480	294.1000	203.9051	151.0338	(83)
Total gains	595.5384	671.6884	733.6411	773.8974	772.6297	766.3358	735.1384	721.1665	706.0332	652.5081	589.9667	561.2875	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	58.3327	
alpha	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	4.8888	
util living area													
	0.9804	0.9641	0.9267	0.8458	0.7003	0.4838	0.3244	0.3404	0.5923	0.8516	0.9595	0.9845	(86)
MIT	20.0066	20.1939	20.4658	20.7382	20.9198	20.9894	20.9988	20.9985	20.9710	20.7680	20.3428	19.9519	(87)
Th 2	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	19.8253	(88)
util rest of house													
	0.9736	0.9521	0.9029	0.7984	0.6195	0.3785	0.2094	0.2235	0.4870	0.7960	0.9435	0.9790	(89)
MIT 2	18.7324	18.9639	19.2915	19.5980	19.7734	19.8217	19.8252	19.8251	19.8124	19.6373	19.1518	18.6644	(90)
Living area fraction										fLA = Living area / (4) =		0.4452	(91)
MIT	19.2996	19.5115	19.8143	20.1056	20.2837	20.3415	20.3477	20.3475	20.3282	20.1406	19.6820	19.2376	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2996	19.5115	19.8143	20.1056	20.2837	20.3415	20.3477	20.3475	20.3282	20.1406	19.6820	19.2376	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9697	0.9482	0.9026	0.8108	0.6526	0.4255	0.2607	0.2757	0.5335	0.8126	0.9411	0.9754	(94)
Useful gains	577.5003	636.9208	662.1862	627.4513	504.1882	326.0433	191.6481	198.8139	376.6577	530.2194	555.2125	547.4905	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1028.8904	1000.7670	899.5244	739.4867	535.0181	329.0759	191.8474	199.0806	386.0746	626.0926	846.4653	1024.3930	(97)
Space heating kWh													
	335.8342	244.5046	176.5797	80.6655	22.9375	0.0000	0.0000	0.0000	0.0000	71.3296	209.7020	354.8154	(98a)
Space heating requirement - total per year (kWh/year)												1496.3685	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

335.8342	244.5046	176.5797	80.6655	22.9375	0.0000	0.0000	0.0000	0.0000	71.3296	209.7020	354.8154	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1496.3685

Space heating per m2 (98c) / (4) = 27.2563 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	335.8342	244.5046	176.5797	80.6655	22.9375	0.0000	0.0000	0.0000	0.0000	71.3296	209.7020	354.8154	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	335.8342	244.5046	176.5797	80.6655	22.9375	0.0000	0.0000	0.0000	0.0000	71.3296	209.7020	354.8154	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	204.5828	180.6457	191.1727	166.2801	159.9709	142.8216	139.9727	146.2588	148.6732	167.3753	179.9268	202.1086	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	63.0417	55.6655	58.9094	51.2388	49.2946	44.0101	43.1322	45.0693	45.8133	51.5763	55.4440	62.2793	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.0172	2.7252	3.0172	2.9199	3.0172	2.9199	3.0172	3.0172	2.9199	3.0172	2.9199	3.0172	(231)
Lighting	16.4181	13.1712	11.8592	8.6886	6.7113	5.4832	6.1223	7.9579	10.3366	13.5622	15.3184	16.8744	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1496.3685 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 625.4744 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 35.5251 (230a)
Total electricity for the above, kWh/year 35.5251 (231)
Electricity for lighting (calculated in Appendix L) 132.5032 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2289.8712 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1496.3685	27.6700	414.0452	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	625.4744	27.6700	173.0688	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	35.5251	27.6700	9.8298	(249)
Energy for lighting	132.5032	27.6700	36.6636	(250)
Additional standing charges			0.0000	(251)
Total energy cost			633.6074	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1496.3685	0.1568	234.6421	(261)

Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	625.4744	0.1411	88.2732	(264)
Space and water heating			322.9153	(265)
Pumps, fans and electric keep-hot	35.5251	0.1387	4.9278	(267)
Energy for lighting	132.5032	0.1443	19.1243	(268)
Total CO2, kg/year			346.9674	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1496.3685	1.5805	2365.0248	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	625.4744	1.5219	951.8840	(278)
Space and water heating			3316.9088	(279)
Pumps, fans and electric keep-hot	35.5251	1.5128	53.7424	(281)
Energy for lighting	132.5032	1.5338	203.2378	(282)
Total Primary energy kWh/year			3573.8890	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-48	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-48
Plot Address	Flat 16, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.59	**TER**	13.56
Environmental	94 A	**% DER < TER**			51.40
CO_2 Emissions (t/year)	0.49	**DFEE**	39.28	**TFEE**	42.28
Compliance Check	See BREL	**% DFEE < TFEE**			7.11
% DPER < TPER	5.63	**DPER**	67.69	**TPER**	71.73

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	220.38	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	34.73 m	88.53 m²	2.55 m

8.0 Living Area	28.23	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	63.09	38.35	0.00	None	24.74	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	20.49	18.34	0.70	Stairwell Access Corridor 3	2.15	Enter Gross Area
Stairwell Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	15.57	15.57	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	25.80	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	192.24

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
ColdRoof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	88.53	88.53	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	88.53

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.15	
Patio Door	Patio Door	Brickwork	South East	2.46	
SE	Window	Brickwork	South East	5.42	
East	Window	Brickwork	East	16.86	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	29.83	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	11.40	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	5.70	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	5.70	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	8.96	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	11.33	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	37.80	0.02	0.02	RCD	Yes
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	8.96	0.10	0.10	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	4.92	0.33	0.33	AbbeyCalculated	No
E15 Flat roof with parapet	Table K1 - Default	22.14	0.30	0.30		No

Y-value	0.06	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.30	m³/(h.m²) @ 50 Pa
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	10
Downlight	85.00	10.00	850.00	18

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	
25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	
28.0 Water Heating		
Water Heating	Main Heating 2	
SAP Code	914	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

Summary for Input Data

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro	None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-48	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-48
Plot Address	Flat 16, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.59	**TER**	13.56
Environmental	94 A	**% DER < TER**			51.40
CO_2 Emissions (t/year)	0.49	**DFEE**	39.28	**TFEE**	42.28
Compliance Check	See BREL	**% DFEE < TFEE**			7.11
% DPER < TPER	5.63	**DPER**	67.69	**TPER**	71.73

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.3000 (17)
Infiltration rate		0.1650 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1402 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1788	0.1753	0.1718	0.1543	0.1508	0.1332	0.1332	0.1297	0.1402	0.1508	0.1578	0.1648	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.0900	24.7400	38.3500	0.2100	8.0535	110.0000	4218.5000	(29a)
Communal Wall	20.4900	2.1500	18.3400	0.2100	3.8514	110.0000	2017.4000	(29a)
Stairwell Wall	15.5700		15.5700	0.1600	2.4912	110.0000	1712.7000	(29a)
ColdRoof	88.5300		88.5300	0.0900	7.9677	9.0000	796.7700	(30)
Total net area of external elements Aum(A, m2)			187.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.2720			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19510.6299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		220.3844 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.8300	0.0380	1.1335
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
P4 Party wall - Roof (insulation at ceiling level)	8.9600	0.1010	0.9050
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9200	0.3300	1.6236
E15 Flat roof with parapet	22.1400	0.3000	6.6420

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7547 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.0267 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	(39)
Average = Sum(39)m / 12 =												102.2757	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	(40)
HLP (average)												1.1553	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)
Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
										Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
12Total per year (kWh/year)												2432	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2100	131.9825	119.2100	123.1837	119.2100	123.1837	119.2100	119.2100	123.1837	119.2100	123.1837	119.2100	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains	515.6824	528.3777	504.5516	484.6874	457.5630	439.0886	420.4867	421.5043	435.7267	452.4980	483.3190	503.8885	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	673.4964	818.4677	947.3248	1092.7755	1180.3625	1171.6370	1120.7570	1036.1294	936.9106	786.5029	676.4761	636.1307	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	
alpha	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	
util living area	0.9910	0.9784	0.9483	0.8662	0.7215	0.5403	0.3977	0.4471	0.6882	0.9183	0.9816	0.9930	(86)
MIT	19.6113	19.8712	20.2197	20.6117	20.8671	20.9713	20.9942	20.9903	20.9187	20.5444	19.9889	19.5499	(87)
Th 2	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	(88)
util rest of house	0.9885	0.9725	0.9343	0.8330	0.6625	0.4595	0.3053	0.3490	0.6061	0.8894	0.9755	0.9910	(89)
MIT 2	18.3539	18.6820	19.1150	19.5783	19.8490	19.9398	19.9540	19.9524	19.9028	19.5152	18.8344	18.2759	(90)
Living area fraction									fLA = Living area / (4) =			0.3189	(91)
MIT	18.7549	19.0612	19.4672	19.9079	20.1737	20.2687	20.2857	20.2834	20.2268	19.8434	19.2025	18.6822	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7549	19.0612	19.4672	19.9079	20.1737	20.2687	20.2857	20.2834	20.2268	19.8434	19.2025	18.6822	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9844	0.9658	0.9264	0.8312	0.6755	0.4843	0.3347	0.3802	0.6287	0.8857	0.9696	0.9875	(94)
Useful gains	662.9711	790.4948	877.5883	908.3661	797.3211	567.4488	375.1643	393.9870	589.0451	696.6161	655.9135	628.1853	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1478.3844	1448.3456	1326.2347	1125.8361	866.6505	579.7725	376.9605	397.1759	626.6184	945.3755	1237.7955	1481.1746	(97)
Space heating kWh	606.6675	442.0757	333.7929	156.5784	51.5811	0.0000	0.0000	0.0000	0.0000	185.0769	418.9550	634.6240	(98a)
Space heating requirement - total per year (kWh/year)												2829.3516	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	606.6675	442.0757	333.7929	156.5784	51.5811	0.0000	0.0000	0.0000	0.0000	185.0769	418.9550	634.6240	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2829.3516	
Space heating per m2											(98c) / (4) =	31.9592	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	606.6675	442.0757	333.7929	156.5784	51.5811	0.0000	0.0000	0.0000	0.0000	185.0769	418.9550	634.6240	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	606.6675	442.0757	333.7929	156.5784	51.5811	0.0000	0.0000	0.0000	0.0000	185.0769	418.9550	634.6240	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2829.3516	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	749.5372	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3831.9935	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2829.3516	0.1561	441.7650	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			547.6029	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			583.8119	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2829.3516	1.5780	4464.7858	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			5605.6844	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			5992.6999	(286)
Dwelling Primary energy Rate (DPER)			67.6900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b)	= 225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 225.7515	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1329	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3829	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3255	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4150	0.4068	0.3987	0.3580	0.3499	0.3092	0.3092	0.3010	0.3255	0.3499	0.3661	0.3824	(22b)
Effective ac	0.5861	0.5828	0.5795	0.5641	0.5612	0.5478	0.5478	0.5453	0.5530	0.5612	0.5670	0.5731	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.9900	1.1450	22.8893			(27)
Brickwork	63.0900	19.9900	43.1000	0.1800	7.7580			(29a)
Communal Wall	20.4900	2.1500	18.3400	0.1800	3.3012			(29a)
Stairwell Wall	15.5700		15.5700	0.1800	2.8026			(29a)
ColdRoof	88.5300		88.5300	0.1100	9.7383			(30)
Total net area of external elements Aum(A, m2)			187.6800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6394			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 220.3844 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	29.8300	0.0700	2.0881	
E16 Corner (normal)	11.4000	0.0900	1.0260	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130	
E18 Party wall between dwellings	5.7000	0.0600	0.3420	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665	
E4 Jamb	37.8000	0.0500	1.8900	
P4 Party wall - Roof (insulation at ceiling level)	8.9600	0.1200	1.0752	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9200	0.0200	0.0984	
E15 Flat roof with parapet	22.1400	0.5600	12.3984	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.9716 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 67.6110 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6629	43.4138	43.1697	42.0230	41.8085	40.8098	40.8098	40.6248	41.1945	41.8085	42.2425	42.6962	(38)
Heat transfer coeff	111.2739	111.0248	110.7807	109.6340	109.4195	108.4208	108.4208	108.2359	108.8055	109.4195	109.8535	110.3072	(39)

Average = Sum(39)m / 12 = 109.6330

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2569	1.2541	1.2513	1.2384	1.2360	1.2247	1.2247	1.2226	1.2290	1.2360	1.2409	1.2460	(40)
HLP (average)												1.2384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

265.9895	235.1357	249.4246	218.2505	210.8868	189.2764	186.1876	193.9523	196.5057	220.0343	235.1073	262.9338	(62)
WWHRS -31.0401	-27.4522	-28.7463	-23.8031	-22.1836	-18.9827	-17.7932	-18.9213	-19.6402	-23.1537	-26.2303	-30.4653	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)
									Total per year (kWh/year) = Sum(64)m =		2375.2726	(64)
12Total per year (kWh/year)											2375	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

110.2246	97.8577	104.7168	93.6487	91.9030	84.0148	83.6905	86.2723	86.4186	94.9445	99.2536	109.2086	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.1892	131.9595	119.1892	123.1622	119.1892	123.1622	119.1892	119.1892	123.1622	119.1892	123.1622	119.1892	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	148.1514	145.6216	140.7484	130.0677	123.5255	116.6873	112.4872	115.9573	120.0258	127.6136	137.8523	146.7858	(72)
Total internal gains	568.7636	581.4567	557.6328	537.7680	510.6442	489.1692	470.5679	471.5855	485.8073	505.5792	536.3995	556.9698	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	13.6200	19.6403	0.6300	0.7000	0.7700	81.7516	(76)
Southeast	6.3700	36.7938	0.6300	0.7000	0.7700	71.6286	(77)

Solar gains	153.3802	281.9334	430.3105	590.9571	702.4273	711.8981	680.5313	597.3060	487.0716	324.6097	187.7292	128.5277	(83)
Total gains	722.1438	863.3901	987.9434	1128.7250	1213.0715	1201.0673	1151.0992	1068.8915	972.8788	830.1889	724.1286	685.4974	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.7052	48.8145	48.9221	49.4337	49.5307	49.9869	49.9869	50.0723	49.8102	49.5307	49.3350	49.1320	
alpha	4.2470	4.2543	4.2615	4.2956	4.3020	4.3325	4.3325	4.3382	4.3207	4.3020	4.2890	4.2755	
util living area	0.9889	0.9761	0.9474	0.8704	0.7341	0.5538	0.4090	0.4566	0.6948	0.9142	0.9781	0.9910	(86)
MIT	19.5036	19.7637	20.1223	20.5482	20.8332	20.9622	20.9918	20.9870	20.9017	20.5023	19.9259	19.4615	(87)
Th 2	19.8747	19.8770	19.8792	19.8894	19.8913	19.9003	19.9003	19.9020	19.8969	19.8913	19.8874	19.8834	(88)
util rest of house	0.9857	0.9694	0.9329	0.8366	0.6732	0.4680	0.3095	0.3521	0.6094	0.8835	0.9709	0.9884	(89)
MIT 2	18.1608	18.4903	18.9374	19.4507	19.7571	19.8791	19.8977	19.8973	19.8329	19.4141	18.7061	18.1133	(90)
Living area fraction									fLA = Living area / (4) =			0.3189	(91)
MIT	18.5890	18.8964	19.3152	19.8006	20.1002	20.2245	20.2466	20.2448	20.1737	19.7611	19.0951	18.5432	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5890	18.8964	19.3152	19.8006	20.1002	20.2245	20.2466	20.2448	20.1737	19.7611	19.0951	18.5432	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9806	0.9618	0.9238	0.8336	0.6855	0.4941	0.3413	0.3853	0.6323	0.8792	0.9639	0.9839	(94)
Useful gains	708.1196	830.3971	912.6880	940.8829	831.5170	593.4465	392.8232	411.8764	615.1538	729.8769	698.0049	674.4911	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1589.9932	1553.9428	1419.6813	1195.0819	919.1469	609.8111	395.3638	416.1481	660.8550	1002.4047	1317.6990	1582.1582	(97)
Space heating kWh	656.1140	486.2227	377.2030	183.0233	65.1967	0.0000	0.0000	0.0000	0.0000	202.7607	446.1797	675.3044	(98a)
Space heating requirement - total per year (kWh/year)												3092.0044	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	656.1140	486.2227	377.2030	183.0233	65.1967	0.0000	0.0000	0.0000	0.0000	202.7607	446.1797	675.3044	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3092.0044	
Space heating per m2										(98c) / (4) =		34.9261	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	656.1140	486.2227	377.2030	183.0233	65.1967	0.0000	0.0000	0.0000	0.0000	202.7607	446.1797	675.3044	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	710.8494	526.7852	408.6706	198.2918	70.6356	0.0000	0.0000	0.0000	0.0000	219.6757	483.4017	731.6407	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2356	85.9004	85.2512	83.9242	81.9323	79.8000	79.8000	79.8000	79.8000	84.1259	85.7174	86.3073	(217)
Fuel for water heating, kWh/month	272.4506	241.7725	258.8566	231.6941	230.3160	213.4006	211.0205	219.3371	221.6360	234.0310	243.6811	269.3498	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.7652	19.8675	17.8885	13.1059	10.1234	8.2709	9.2349	12.0038	15.5918	20.4573	23.1065	25.4535	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4691	-34.6369	-52.0885	-61.3552	-68.5894	-64.8930	-64.0827	-59.2821	-51.2531	-40.8103	-26.3403	-20.1124	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.9372	-19.1683	-38.7962	-59.3119	-79.4625	-80.2372	-79.3113	-66.6912	-48.2675	-27.7712	-12.0453	-7.0415	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3349.9506	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2847.5460	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	199.8690	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1093.9542	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5389.4114	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3349.9506	0.2100	703.4896	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2847.5460	0.2100	597.9847	(264)
Space and water heating			1301.4743	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.8690	0.1443	28.8473	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9130	0.1336	-75.7632	
PV Unit electricity exported	-527.0413	0.1254	-66.0771	
Total			-141.8403	(269)
Total CO2, kg/year			1200.4105	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3349.9506	1.1300	3785.4442	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2847.5460	1.1300	3217.7270	(278)
Space and water heating			7003.1712	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.8690	1.5338	306.5658	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9130	1.4939	-846.8906	
PV Unit electricity exported	-527.0413	0.4602	-242.5351	
Total			-1089.4257	(283)
Total Primary energy kWh/year			6350.4120	(286)
Target Primary Energy Rate (TPER)			71.7300	(287)

Full SAP Calculation Printout

Plot Reference	P-48	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-48
Plot Address	Flat 16, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.59	**TER**	13.56
Environmental	94 A	**% DER < TER**			51.40
CO_2 Emissions (t/year)	0.49	**DFEE**	39.28	**TFEE**	42.28
Compliance Check	See BREL	**% DFEE < TFEE**			7.11
% DPER < TPER	5.63	**DPER**	67.69	**TPER**	71.73

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1329 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.3000 (17)
Infiltration rate			0.2979 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2532 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3228	0.3165	0.3102	0.2785	0.2722	0.2405	0.2405	0.2342	0.2532	0.2722	0.2849	0.2975	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5521	0.5501	0.5481	0.5388	0.5370	0.5289	0.5289	0.5274	0.5321	0.5370	0.5406	0.5443	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.0900	24.7400	38.3500	0.2100	8.0535	110.0000	4218.5000	(29a)
Communal Wall	20.4900	2.1500	18.3400	0.2100	3.8514	110.0000	2017.4000	(29a)
Stairwell Wall	15.5700		15.5700	0.1600	2.4912	110.0000	1712.7000	(29a)
ColdRoof	88.5300		88.5300	0.0900	7.9677	9.0000	796.7700	(30)
Total net area of external elements Aum(A, m2)			187.6800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.2720			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19510.6299	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							220.3844	(35)
List of Thermal Bridges								
K1 Element					Length	Psi-value	Total	

E7 Party floor between dwellings (in blocks of flats)	29.8300	0.0380	1.1335	
E16 Corner (normal)	11.4000	0.0540	0.6156	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529	
E18 Party wall between dwellings	5.7000	0.0380	0.2166	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665	
E4 Jamb	37.8000	0.0160	0.6048	
P4 Party wall - Roof (insulation at ceiling level)	8.9600	0.1010	0.9050	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9200	0.3300	1.6236	
E15 Flat roof with parapet	22.1400	0.3000	6.6420	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.7547 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	65.0267 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.1312	40.9805	40.8327	40.1387	40.0088	39.4043	39.4043	39.2924	39.6372	40.0088	40.2715	40.5461	(38)
Heat transfer coeff	106.1580	106.0072	105.8595	105.1654	105.0356	104.4311	104.4311	104.3191	104.6639	105.0356	105.2983	105.5729	(39)
Average = Sum(39)m / 12 =												105.1648	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1991	1.1974	1.1957	1.1879	1.1864	1.1796	1.1796	1.1783	1.1822	1.1864	1.1894	1.1925	(40)
HLP (average)												1.1879	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6051	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)
Hot water usage for other uses	41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)
Average daily hot water use (litres/day)												64.7389	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.6300	68.6924	66.5771	63.9443	61.5955	59.1546	58.6475	60.7586	62.9237	65.4304	68.0865	70.5309	(44)
Energy conte	111.8607	97.8171	102.3265	87.5365	82.9194	72.7375	70.9291	75.2318	77.5912	88.7884	97.0017	110.4343	(45)
Energy content (annual)										Total = Sum(45)m =		1075.1741	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(64)
										Total per year (kWh/year) = Sum(64)m =		913.8980	(64)
12Total per year (kWh/year)												914	(64)
Electric shower(s)	54.3750	48.4486	52.9040	50.4856	51.4330	49.0621	50.6975	51.4330	50.4856	52.9040	51.9092	54.3750	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		618.5126	(64a)
Heat gains from water heating, kWh/month	37.3642	32.8983	34.9704	31.2229	30.4786	27.7222	27.7468	28.8450	29.1095	32.0935	33.5902	37.0611	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2100	131.9825	119.2100	123.1837	119.2100	123.1837	119.2100	119.2100	123.1837	119.2100	123.1837	119.2100	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	50.2206	48.9558	47.0032	43.3652	40.9659	38.5031	37.2941	38.7702	40.4299	43.1365	46.6530	49.8132	(72)
Total internal gains	467.8537	481.8139	460.9085	448.0869	425.1054	411.0065	395.3956	394.4191	406.2329	418.1229	442.2217	457.0181	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	625.6677	771.9039	903.6817	1056.1750	1147.9049	1143.5549	1095.6659	1009.0442	907.4168	752.1278	635.3789	589.2602	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.0524	51.1250	51.1964	51.5342	51.5980	51.8966	51.8966	51.9523	51.7812	51.5980	51.4692	51.3353	
alpha	4.4035	4.4083	4.4131	4.4356	4.4399	4.4598	4.4598	4.4635	4.4521	4.4399	4.4313	4.4224	
util living area	0.9934	0.9832	0.9579	0.8832	0.7450	0.5611	0.4143	0.4664	0.7133	0.9316	0.9858	0.9949	(86)
MIT	19.4769	19.7457	20.1140	20.5496	20.8386	20.9645	20.9926	20.9877	20.9006	20.4805	19.8902	19.4271	(87)
Th 2	19.9207	19.9221	19.9234	19.9297	19.9309	19.9363	19.9363	19.9374	19.9342	19.9309	19.9285	19.9260	(88)
util rest of house	0.9914	0.9784	0.9459	0.8521	0.6860	0.4770	0.3167	0.3631	0.6303	0.9059	0.9810	0.9934	(89)
MIT 2	18.5476	18.8141	19.1739	19.5850	19.8286	19.9207	19.9344	19.9339	19.8829	19.5347	18.9642	18.5021	(90)
Living area fraction										fLA = Living area / (4) =		0.3189	(91)
MIT	18.8439	19.1112	19.4737	19.8926	20.1507	20.2535	20.2719	20.2699	20.2074	19.8363	19.2595	18.7971	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8439	19.1112	19.4737	19.8926	20.1507	20.2535	20.2719	20.2699	20.2074	19.8363	19.2595	18.7971	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9888	0.9737	0.9398	0.8509	0.6989	0.5028	0.3479	0.3960	0.6531	0.9032	0.9769	0.9912	(94)
Useful gains	618.6443	751.6141	849.3037	898.6826	802.2971	575.0129	381.1404	399.6178	592.6116	679.2956	620.7041	584.0480	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1543.9543	1506.4902	1373.3865	1156.0397	887.6202	590.4019	383.4555	403.7037	639.2215	970.1396	1280.3691	1541.0580	(97)
Space heating kWh	688.4307	507.2767	389.9176	185.2971	63.4804	0.0000	0.0000	0.0000	0.0000	216.3879	474.9588	712.0154	(98a)
Space heating requirement - total per year (kWh/year)												3237.7646	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	688.4307	507.2767	389.9176	185.2971	63.4804	0.0000	0.0000	0.0000	0.0000	216.3879	474.9588	712.0154	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3237.7646	
Space heating per m2											(98c) / (4) =	36.5725	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	981.6519	772.7898	792.8252	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9088	0.9500	0.9297	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	892.0944	734.1827	737.0975	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1289.9639	1236.3028	1137.3929	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	286.4660	373.5774	297.8198	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	71.6165	93.3943	74.4549	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												239.4658	(107)
Energy for space heating												36.5725	(99)
Energy for space cooling												2.7049	(108)
Total												39.2774	(109)
Fabric Energy Efficiency (DFEE)												39.3	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1329	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3829	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3255	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4150	0.4068	0.3987	0.3580	0.3499	0.3092	0.3092	0.3010	0.3255	0.3499	0.3661	0.3824	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5861	0.5828	0.5795	0.5641	0.5612	0.5478	0.5478	0.5453	0.5530	0.5612	0.5670	0.5731	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.9900	1.1450	22.8893			(27)
Brickwork	63.0900	19.9900	43.1000	0.1800	7.7580			(29a)
Communal Wall	20.4900	2.1500	18.3400	0.1800	3.3012			(29a)
Stairwell Wall	15.5700		15.5700	0.1800	2.8026			(29a)
ColdRoof	88.5300		88.5300	0.1100	9.7383			(30)
Total net area of external elements Aum(A, m2)			187.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.6394			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	220.3844	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.8300	0.0700	2.0881
E16 Corner (normal)	11.4000	0.0900	1.0260
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130
E18 Party wall between dwellings	5.7000	0.0600	0.3420
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0500	1.8900
P4 Party wall - Roof (insulation at ceiling level)	8.9600	0.1200	1.0752
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9200	0.0200	0.0984
E15 Flat roof with parapet	22.1400	0.5600	12.3984

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	18.9716	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 67.6110	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6629	43.4138	43.1697	42.0230	41.8085	40.8098	40.8098	40.6248	41.1945	41.8085	42.2425	42.6962	(38)
Heat transfer coeff	111.2739	111.0248	110.7807	109.6340	109.4195	108.4208	108.4208	108.2359	108.8055	109.4195	109.8535	110.3072	(39)
Average = Sum(39)m / 12 =												109.6330	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2569	1.2541	1.2513	1.2384	1.2360	1.2247	1.2247	1.2226	1.2290	1.2360	1.2409	1.2460	(40)
HLP (average)												1.2384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6051	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

	41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day)	64.7389	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.6300	68.6924	66.5771	63.9443	61.5955	59.1546	58.6475	60.7586	62.9237	65.4304	68.0865	70.5309	(44)
Energy conte	111.8607	97.8171	102.3265	87.5365	82.9194	72.7375	70.9291	75.2318	77.5912	88.7884	97.0017	110.4343	(45)
Energy content (annual)										Total = Sum(45)m =		1075.1741	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	95.0816	83.1445	86.9775	74.4060	70.4815	61.8268	60.2897	63.9470	65.9525	75.4701	82.4514	93.8692	(64)
										Total per year (kWh/year) = Sum(64)m =		913.8980	(64)
12Total per year (kWh/year)												914	(64)

Electric shower(s)

	54.3750	48.4486	52.9040	50.4856	51.4330	49.0621	50.6975	51.4330	50.4856	52.9040	51.9092	54.3750	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		618.5126	(64a)

Heat gains from water heating, kWh/month

	37.3642	32.8983	34.9704	31.2229	30.4786	27.7222	27.7468	28.8450	29.1095	32.0935	33.5902	37.0611 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	119.1892	131.9595	119.1892	123.1622	119.1892	123.1622	119.1892	119.1892	123.1622	119.1892	123.1622	119.1892	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)													
	50.2206	48.9558	47.0032	43.3652	40.9659	38.5031	37.2941	38.7702	40.4299	43.1365	46.6530	49.8132	(72)
Total internal gains													
	467.8329	481.7909	460.8877	448.0654	425.0846	410.9850	395.3748	394.3983	406.2114	418.1021	442.2002	456.9972	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	13.6200	19.6403	0.6300	0.7000	0.7700	81.7516	(76)
Southeast	6.3700	36.7938	0.6300	0.7000	0.7700	71.6286	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	153.3802	281.9334	430.3105	590.9571	702.4273	711.8981	680.5313	597.3060	487.0716	324.6097	187.7292	128.5277	(83)
Total gains	621.2131	763.7243	891.1982	1039.0225	1127.5119	1122.8831	1075.9061	991.7043	893.2829	742.7118	629.9294	585.5249	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.7052	48.8145	48.9221	49.4337	49.5307	49.9869	49.9869	50.0723	49.8102	49.5307	49.3350	49.1320	
alpha	4.2470	4.2543	4.2615	4.2956	4.3020	4.3325	4.3325	4.3382	4.3207	4.3020	4.2890	4.2755	
util living area													
	0.9936	0.9844	0.9621	0.8954	0.7676	0.5862	0.4360	0.4891	0.7356	0.9382	0.9867	0.9950	(86)
MIT	19.3769	19.6447	20.0195	20.4799	20.8002	20.9530	20.9896	20.9831	20.8768	20.4206	19.8121	19.3347	(87)
Th 2	19.8747	19.8770	19.8792	19.8894	19.8913	19.9003	19.9003	19.9020	19.8969	19.8913	19.8874	19.8834	(88)
util rest of house													
	0.9917	0.9799	0.9510	0.8659	0.7086	0.4977	0.3307	0.3785	0.6514	0.9139	0.9821	0.9935	(89)
MIT 2	18.4139	18.6804	19.0482	19.4889	19.7636	19.8794	19.8976	19.8972	19.8326	19.4476	18.8560	18.3784	(90)
Living area fraction										fLA = Living area / (4) =		0.3189	(91)
MIT	18.7210	18.9879	19.3580	19.8049	20.0941	20.2218	20.2458	20.2435	20.1655	19.7579	19.1609	18.6833	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7210	18.9879	19.3580	19.8049	20.0941	20.2218	20.2458	20.2435	20.1655	19.7579	19.1609	18.6833	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9890	0.9752	0.9446	0.8634	0.7203	0.5245	0.3643	0.4138	0.6736	0.9103	0.9779	0.9913	(94)
Useful gains	614.4020	744.7728	841.7864	897.0429	812.1513	588.9832	392.0011	410.3730	601.7242	676.1060	616.0377	580.4236	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1604.6771	1564.1040	1424.4127	1195.5526	918.4816	609.5187	395.2827	416.0016	659.9648	1002.0488	1324.9328	1597.6169	(97)
Space heating kWh													
	736.7646	550.5906	433.4740	214.9270	79.1097	0.0000	0.0000	0.0000	0.0000	242.5015	510.4045	756.7918	(98a)
Space heating requirement - total per year (kWh/year)												3524.5636	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	736.7646	550.5906	433.4740	214.9270	79.1097	0.0000	0.0000	0.0000	0.0000	242.5015	510.4045	756.7918	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3524.5636	
Space heating per m2											(98c) / (4) =	39.8121	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1019.1555	802.3139	822.5925	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8888	0.9366	0.9132	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	905.8274	751.4075	751.1616	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1265.8255	1213.2292	1117.1472	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	259.1986	343.5954	272.2933	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	64.7997	85.8988	68.0733	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												218.7718	(107)
Energy for space heating												39.8121	(99)
Energy for space cooling												2.4712	(108)
Total												42.2832	(109)
Fabric Energy Efficiency (TFEE)												42.3	(109)

Full SAP Calculation Printout

Plot Reference	P-48	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-48
Plot Address	Flat 16, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.59	**TER**	13.56
Environmental	94 A	**% DER < TER**			51.40
CO_2 Emissions (t/year)	0.49	**DFEE**	39.28	**TFEE**	42.28
Compliance Check	See BREL	**% DFEE < TFEE**			7.11
% DPER < TPER	5.63	**DPER**	67.69	**TPER**	71.73

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.3000 (17)
Infiltration rate		0.1650 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1402 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1788	0.1753	0.1718	0.1543	0.1508	0.1332	0.1332	0.1297	0.1402	0.1508	0.1578	0.1648	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.0900	24.7400	38.3500	0.2100	8.0535	110.0000	4218.5000	(29a)
Communal Wall	20.4900	2.1500	18.3400	0.2100	3.8514	110.0000	2017.4000	(29a)
Stairwell Wall	15.5700		15.5700	0.1600	2.4912	110.0000	1712.7000	(29a)
ColdRoof	88.5300		88.5300	0.0900	7.9677	9.0000	796.7700	(30)
Total net area of external elements Aum(A, m2)			187.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.2720			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19510.6299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		220.3844 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.8300	0.0380	1.1335
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
P4 Party wall - Roof (insulation at ceiling level)	8.9600	0.1010	0.9050
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9200	0.3300	1.6236
E15 Flat roof with parapet	22.1400	0.3000	6.6420

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7547 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.0267 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	(39)
Average = Sum(39)m / 12 =												102.2757	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	(40)
HLP (average)												1.1553	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)
Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
										Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
12Total per year (kWh/year)												2432	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2100	131.9825	119.2100	123.1837	119.2100	123.1837	119.2100	119.2100	123.1837	119.2100	123.1837	119.2100	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains	515.6824	528.3777	504.5516	484.6874	457.5630	439.0886	420.4867	421.5043	435.7267	452.4980	483.3190	503.8885	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	673.4964	818.4677	947.3248	1092.7755	1180.3625	1171.6370	1120.7570	1036.1294	936.9106	786.5029	676.4761	636.1307	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	
alpha	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	
util living area	0.9910	0.9784	0.9483	0.8662	0.7215	0.5403	0.3977	0.4471	0.6882	0.9183	0.9816	0.9930	(86)
MIT	19.6113	19.8712	20.2197	20.6117	20.8671	20.9713	20.9942	20.9903	20.9187	20.5444	19.9889	19.5499	(87)
Th 2	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	(88)
util rest of house	0.9885	0.9725	0.9343	0.8330	0.6625	0.4595	0.3053	0.3490	0.6061	0.8894	0.9755	0.9910	(89)
MIT 2	18.3539	18.6820	19.1150	19.5783	19.8490	19.9398	19.9540	19.9524	19.9028	19.5152	18.8344	18.2759	(90)
Living area fraction									fLA = Living area / (4) =			0.3189	(91)
MIT	18.7549	19.0612	19.4672	19.9079	20.1737	20.2687	20.2857	20.2834	20.2268	19.8434	19.2025	18.6822	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7549	19.0612	19.4672	19.9079	20.1737	20.2687	20.2857	20.2834	20.2268	19.8434	19.2025	18.6822	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9844	0.9658	0.9264	0.8312	0.6755	0.4843	0.3347	0.3802	0.6287	0.8857	0.9696	0.9875	(94)
Useful gains	662.9711	790.4948	877.5883	908.3661	797.3211	567.4488	375.1643	393.9870	589.0451	696.6161	655.9135	628.1853	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1478.3844	1448.3456	1326.2347	1125.8361	866.6505	579.7725	376.9605	397.1759	626.6184	945.3755	1237.7955	1481.1746	(97)
Space heating kWh	606.6675	442.0757	333.7929	156.5784	51.5811	0.0000	0.0000	0.0000	0.0000	185.0769	418.9550	634.6240	(98a)
Space heating requirement - total per year (kWh/year)												2829.3516	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	606.6675	442.0757	333.7929	156.5784	51.5811	0.0000	0.0000	0.0000	0.0000	185.0769	418.9550	634.6240	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2829.3516	
Space heating per m2											(98c) / (4) =	31.9592	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	606.6675	442.0757	333.7929	156.5784	51.5811	0.0000	0.0000	0.0000	0.0000	185.0769	418.9550	634.6240	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	606.6675	442.0757	333.7929	156.5784	51.5811	0.0000	0.0000	0.0000	0.0000	185.0769	418.9550	634.6240	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2829.3516	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	

Water heating fuel used	749.5372	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3831.9935	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2829.3516	0.1561	441.7650	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			547.6029	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			583.8119	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2829.3516	1.5780	4464.7858	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			5605.6844	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			5992.6999	(286)
Dwelling Primary energy Rate (DPER)			67.6900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b)	= 225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 225.7515	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1329	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3829	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3255	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4150	0.4068	0.3987	0.3580	0.3499	0.3092	0.3092	0.3010	0.3255	0.3499	0.3661	0.3824	(22b)
Effective ac	0.5861	0.5828	0.5795	0.5641	0.5612	0.5478	0.5478	0.5453	0.5530	0.5612	0.5670	0.5731	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.9900	1.1450	22.8893			(27)
Brickwork	63.0900	19.9900	43.1000	0.1800	7.7580			(29a)
Communal Wall	20.4900	2.1500	18.3400	0.1800	3.3012			(29a)
Stairwell Wall	15.5700		15.5700	0.1800	2.8026			(29a)
ColdRoof	88.5300		88.5300	0.1100	9.7383			(30)
Total net area of external elements Aum(A, m2)			187.6800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6394			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 220.3844 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	29.8300	0.0700	2.0881	
E16 Corner (normal)	11.4000	0.0900	1.0260	
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0900	-0.5130	
E18 Party wall between dwellings	5.7000	0.0600	0.3420	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665	
E4 Jamb	37.8000	0.0500	1.8900	
P4 Party wall - Roof (insulation at ceiling level)	8.9600	0.1200	1.0752	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9200	0.0200	0.0984	
E15 Flat roof with parapet	22.1400	0.5600	12.3984	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.9716 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 67.6110 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6629	43.4138	43.1697	42.0230	41.8085	40.8098	40.8098	40.6248	41.1945	41.8085	42.2425	42.6962	(38)
Heat transfer coeff	111.2739	111.0248	110.7807	109.6340	109.4195	108.4208	108.4208	108.2359	108.8055	109.4195	109.8535	110.3072	(39)

Average = Sum(39)m / 12 = 109.6330

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2569	1.2541	1.2513	1.2384	1.2360	1.2247	1.2247	1.2226	1.2290	1.2360	1.2409	1.2460	(40)
HLP (average)												1.2384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

265.9895	235.1357	249.4246	218.2505	210.8868	189.2764	186.1876	193.9523	196.5057	220.0343	235.1073	262.9338	(62)
WWHRS -31.0401	-27.4522	-28.7463	-23.8031	-22.1836	-18.9827	-17.7932	-18.9213	-19.6402	-23.1537	-26.2303	-30.4653	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)
									Total per year (kWh/year) = Sum(64)m =		2375.2726	(64)
12Total per year (kWh/year)											2375	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

110.2246	97.8577	104.7168	93.6487	91.9030	84.0148	83.6905	86.2723	86.4186	94.9445	99.2536	109.2086	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	130.2530	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.1892	131.9595	119.1892	123.1622	119.1892	123.1622	119.1892	119.1892	123.1622	119.1892	123.1622	119.1892	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3472	238.7997	232.6194	219.4622	202.8536	187.2439	176.8156	174.3630	180.5434	193.7006	210.3092	225.9189	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	36.0253	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	148.1514	145.6216	140.7484	130.0677	123.5255	116.6873	112.4872	115.9573	120.0258	127.6136	137.8523	146.7858	(72)
Total internal gains	568.7636	581.4567	557.6328	537.7680	510.6442	489.1692	470.5679	471.5855	485.8073	505.5792	536.3995	556.9698	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	13.6200	19.6403	0.6300	0.7000	0.7700	81.7516	(76)
Southeast	6.3700	36.7938	0.6300	0.7000	0.7700	71.6286	(77)

Solar gains	153.3802	281.9334	430.3105	590.9571	702.4273	711.8981	680.5313	597.3060	487.0716	324.6097	187.7292	128.5277	(83)
Total gains	722.1438	863.3901	987.9434	1128.7250	1213.0715	1201.0673	1151.0992	1068.8915	972.8788	830.1889	724.1286	685.4974	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.7052	48.8145	48.9221	49.4337	49.5307	49.9869	49.9869	50.0723	49.8102	49.5307	49.3350	49.1320	
alpha	4.2470	4.2543	4.2615	4.2956	4.3020	4.3325	4.3325	4.3382	4.3207	4.3020	4.2890	4.2755	
util living area	0.9889	0.9761	0.9474	0.8704	0.7341	0.5538	0.4090	0.4566	0.6948	0.9142	0.9781	0.9910	(86)
MIT	19.5036	19.7637	20.1223	20.5482	20.8332	20.9622	20.9918	20.9870	20.9017	20.5023	19.9259	19.4615	(87)
Th 2	19.8747	19.8770	19.8792	19.8894	19.8913	19.9003	19.9003	19.9020	19.8969	19.8913	19.8874	19.8834	(88)
util rest of house	0.9857	0.9694	0.9329	0.8366	0.6732	0.4680	0.3095	0.3521	0.6094	0.8835	0.9709	0.9884	(89)
MIT 2	18.1608	18.4903	18.9374	19.4507	19.7571	19.8791	19.8977	19.8973	19.8329	19.4141	18.7061	18.1133	(90)
Living area fraction									fLA = Living area / (4) =			0.3189	(91)
MIT	18.5890	18.8964	19.3152	19.8006	20.1002	20.2245	20.2466	20.2448	20.1737	19.7611	19.0951	18.5432	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5890	18.8964	19.3152	19.8006	20.1002	20.2245	20.2466	20.2448	20.1737	19.7611	19.0951	18.5432	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9806	0.9618	0.9238	0.8336	0.6855	0.4941	0.3413	0.3853	0.6323	0.8792	0.9639	0.9839	(94)
Useful gains	708.1196	830.3971	912.6880	940.8829	831.5170	593.4465	392.8232	411.8764	615.1538	729.8769	698.0049	674.4911	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1589.9932	1553.9428	1419.6813	1195.0819	919.1469	609.8111	395.3638	416.1481	660.8550	1002.4047	1317.6990	1582.1582	(97)
Space heating kWh	656.1140	486.2227	377.2030	183.0233	65.1967	0.0000	0.0000	0.0000	0.0000	202.7607	446.1797	675.3044	(98a)
Space heating requirement - total per year (kWh/year)												3092.0044	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	656.1140	486.2227	377.2030	183.0233	65.1967	0.0000	0.0000	0.0000	0.0000	202.7607	446.1797	675.3044	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3092.0044	
Space heating per m2										(98c) / (4) =		34.9261	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	656.1140	486.2227	377.2030	183.0233	65.1967	0.0000	0.0000	0.0000	0.0000	202.7607	446.1797	675.3044	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	710.8494	526.7852	408.6706	198.2918	70.6356	0.0000	0.0000	0.0000	0.0000	219.6757	483.4017	731.6407	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	234.9493	207.6836	220.6783	194.4475	188.7032	170.2937	168.3944	175.0310	176.8655	196.8806	208.8771	232.4685	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2356	85.9004	85.2512	83.9242	81.9323	79.8000	79.8000	79.8000	79.8000	84.1259	85.7174	86.3073	(217)
Fuel for water heating, kWh/month	272.4506	241.7725	258.8566	231.6941	230.3160	213.4006	211.0205	219.3371	221.6360	234.0310	243.6811	269.3498	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.7652	19.8675	17.8885	13.1059	10.1234	8.2709	9.2349	12.0038	15.5918	20.4573	23.1065	25.4535	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4691	-34.6369	-52.0885	-61.3552	-68.5894	-64.8930	-64.0827	-59.2821	-51.2531	-40.8103	-26.3403	-20.1124	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.9372	-19.1683	-38.7962	-59.3119	-79.4625	-80.2372	-79.3113	-66.6912	-48.2675	-27.7712	-12.0453	-7.0415	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3349.9506	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2847.5460	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	199.8690	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1093.9542	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5389.4114	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3349.9506	0.2100	703.4896	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2847.5460	0.2100	597.9847	(264)
Space and water heating			1301.4743	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.8690	0.1443	28.8473	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9130	0.1336	-75.7632	
PV Unit electricity exported	-527.0413	0.1254	-66.0771	
Total			-141.8403	(269)
Total CO2, kg/year			1200.4105	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3349.9506	1.1300	3785.4442	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2847.5460	1.1300	3217.7270	(278)
Space and water heating			7003.1712	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.8690	1.5338	306.5658	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-566.9130	1.4939	-846.8906	
PV Unit electricity exported	-527.0413	0.4602	-242.5351	
Total			-1089.4257	(283)
Total Primary energy kWh/year			6350.4120	(286)
Target Primary Energy Rate (TPER)			71.7300	(287)

Full SAP Calculation Printout

Plot Reference	P-48	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-48
Plot Address	Flat 16, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	74 C	**DER**	6.59	**TER**	13.56
Environmental	94 A	**% DER < TER**			51.40
CO_2 Emissions (t/year)	0.49	**DFEE**	39.28	**TFEE**	42.28
Compliance Check	See BREL	**% DFEE < TFEE**			7.11
% DPER < TPER	5.63	**DPER**	67.69	**TPER**	71.73

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.7515	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3000	(17)
Infiltration rate		0.1650	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1402	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1788	0.1753	0.1718	0.1543	0.1508	0.1332	0.1332	0.1297	0.1402	0.1508	0.1578	0.1648	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.0900	24.7400	38.3500	0.2100	8.0535	110.0000	4218.5000	(29a)
Communal Wall	20.4900	2.1500	18.3400	0.2100	3.8514	110.0000	2017.4000	(29a)
Stairwell Wall	15.5700		15.5700	0.1600	2.4912	110.0000	1712.7000	(29a)
ColdRoof	88.5300		88.5300	0.0900	7.9677	9.0000	796.7700	(30)
Total net area of external elements Aum(A, m2)			187.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.2720			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19510.6299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		220.3844 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.8300	0.0380	1.1335
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
P4 Party wall - Roof (insulation at ceiling level)	8.9600	0.1010	0.9050
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9200	0.3300	1.6236
E15 Flat roof with parapet	22.1400	0.3000	6.6420

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7547 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.0267 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	(39)
Average = Sum(39)m / 12 =												102.2757	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	(40)
HLP (average)												1.1553	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)
Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day) 127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
										Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains	583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	741.6769	871.9844	1005.9722	1136.1045	1215.6574	1193.5049	1142.2328	1059.4965	963.9459	828.8565	726.8638	699.9454	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	
alpha	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	
util living area	0.9870	0.9728	0.9373	0.8524	0.7070	0.5316	0.3905	0.4377	0.6740	0.9048	0.9761	0.9898	(86)
MIT	19.6975	19.9346	20.2792	20.6409	20.8777	20.9731	20.9946	20.9911	20.9253	20.5813	20.0496	19.6315	(87)
Th 2	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	(88)
util rest of house	0.9834	0.9656	0.9211	0.8173	0.6477	0.4516	0.2996	0.3415	0.5920	0.8727	0.9684	0.9870	(89)
MIT 2	18.4629	18.7608	19.1859	19.6097	19.8583	19.9409	19.9542	19.9527	19.9076	19.5561	18.9096	18.3794	(90)
Living area fraction									fLA = Living area / (4) =			0.3189	(91)
MIT	18.8566	19.1351	19.5345	19.9385	20.1834	20.2700	20.2860	20.2838	20.2321	19.8830	19.2731	18.7787	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8566	19.1351	19.5345	19.9385	20.1834	20.2700	20.2860	20.2838	20.2321	19.8830	19.2731	18.7787	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9782	0.9583	0.9132	0.8167	0.6613	0.4762	0.3286	0.3722	0.6149	0.8701	0.9618	0.9825	(94)
Useful gains	725.5187	835.6018	918.6969	927.8189	803.9277	568.3813	375.3200	394.3007	592.7438	721.2009	699.0638	687.7043	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1488.7825	1455.9053	1333.1174	1128.9726	867.6419	579.9067	376.9839	397.2226	627.1643	949.4247	1245.0162	1491.0431	(97)
Space heating kWh	567.8682	416.8440	308.3288	144.8307	47.4033	0.0000	0.0000	0.0000	0.0000	169.7985	393.0857	597.6841	(98a)
Space heating requirement - total per year (kWh/year)												2645.8433	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	567.8682	416.8440	308.3288	144.8307	47.4033	0.0000	0.0000	0.0000	0.0000	169.7985	393.0857	597.6841	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2645.8433	
Space heating per m2											(98c) / (4) =	29.8864	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	567.8682	416.8440	308.3288	144.8307	47.4033	0.0000	0.0000	0.0000	0.0000	169.7985	393.0857	597.6841	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	567.8682	416.8440	308.3288	144.8307	47.4033	0.0000	0.0000	0.0000	0.0000	169.7985	393.0857	597.6841	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2645.8433	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												749.5372	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3648.4852	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2645.8433	16.4900	436.2996	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	16.4900	123.5987	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	16.4900	9.4466	(249)
Energy for lighting	195.8180	16.4900	32.2904	(250)
Additional standing charges			0.0000	(251)
Total energy cost			601.6352	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6220	(257)
SAP value		73.7070	
SAP rating (Section 12)		74	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2645.8433	0.1562	413.2709	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			519.1088	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			555.3177	(272)
CO2 emissions per m2			6.2700	(273)
EI value			94.4273	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b)	x 2.5500	(2b) =	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		225.7515	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	

Measured/design AP50												3.3000	(17)
Infiltration rate												0.1650	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1402	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1508	0.1438	0.1438	0.1332	0.1367	0.1192	0.1192	0.1157	0.1192	0.1332	0.1297	0.1402	(22b)

Mechanical extract ventilation - centralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.0900	24.7400	38.3500	0.2100	8.0535	110.0000	4218.5000	(29a)
Communal Wall	20.4900	2.1500	18.3400	0.2100	3.8514	110.0000	2017.4000	(29a)
Stairwell Wall	15.5700		15.5700	0.1600	2.4912	110.0000	1712.7000	(29a)
ColdRoof	88.5300		88.5300	0.0900	7.9677	9.0000	796.7700	(30)
Total net area of external elements Aum(A, m2)			187.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.2720			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19510.6299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		220.3844 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	29.8300	0.0380	1.1335
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
P4 Party wall - Roof (insulation at ceiling level)	8.9600	0.1010	0.9050
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9200	0.3300	1.6236
E15 Flat roof with parapet	22.1400	0.3000	6.6420

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.7547 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	65.0267 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	(39)
Average = Sum(39)m / 12 =												102.2757	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	(40)
HLP (average)												1.1553	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6051	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)
Hot water usage for baths	29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)
Hot water usage for other uses	41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)
Average daily hot water use (litres/day)												127.3386	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)

											Total per year (kWh/year) = Sum(64)m =	2432.3983	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354		(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024		(71)
Water heating gains (Table 5)													
98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837		(72)
Total internal gains													
583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032		(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	43.0593	0.3300	0.0000	0.7700	26.9158	(77)
East	16.8600	23.8018	0.3300	0.0000	0.7700	101.9698	(76)
Southeast	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(77)

Solar gains	188.1877	302.5209	458.9184	640.7489	742.9149	796.9067	754.0877	677.9214	554.0398	374.0043	226.9565	158.5693	(83)
Total gains	772.0507	884.4153	1022.1173	1168.7653	1235.7728	1257.8633	1196.0501	1122.7928	1016.8018	868.8559	760.6631	726.2725	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	
alpha	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	
util living area													
0.9818	0.9658	0.9198	0.8071	0.6299	0.4178	0.2815	0.3087	0.5777	0.8618	0.9643	0.9855		(86)
MIT	19.8413	20.0516	20.3984	20.7439	20.9332	20.9917	20.9990	20.9984	20.9649	20.7027	20.2045	19.7850	(87)
Th 2	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	(88)
util rest of house													
0.9766	0.9565	0.8989	0.7633	0.5616	0.3363	0.1928	0.2144	0.4876	0.8174	0.9526	0.9813		(89)
MIT 2	18.6452	18.9077	19.3302	19.7224	19.9086	19.9524	19.9558	19.9557	19.9370	19.6911	19.1028	18.5745	(90)
Living area fraction									fLA = Living area / (4) =			0.3189	(91)
MIT	19.0266	19.2724	19.6708	20.0482	20.2354	20.2838	20.2884	20.2882	20.2648	20.0136	19.4541	18.9605	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0266	19.2724	19.6708	20.0482	20.2354	20.2838	20.2884	20.2882	20.2648	20.0136	19.4541	18.9605	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9705	0.9487	0.8922	0.7675	0.5806	0.3622	0.2212	0.2446	0.5152	0.8201	0.9455	0.9759	(94)
Useful gains	749.2563	839.0779	911.9122	897.0373	717.4640	455.5656	264.5105	274.5810	523.8262	712.5849	719.1862	708.7509	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
1424.3522	1388.1320	1255.0053	1037.9103	750.2288	458.5844	264.7321	274.9339	538.4595	870.7391	1171.4805	1417.5891		(97)
Space heating kWh													
502.2714	368.9644	255.2613	101.4286	24.3770	0.0000	0.0000	0.0000	0.0000	117.6667	325.6519	527.3756		(98a)
Space heating requirement - total per year (kWh/year)												2222.9968	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
502.2714	368.9644	255.2613	101.4286	24.3770	0.0000	0.0000	0.0000	0.0000	117.6667	325.6519	527.3756		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2222.9968	
Space heating per m2											(98c) / (4) =	25.1101	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	502.2714	368.9644	255.2613	101.4286	24.3770	0.0000	0.0000	0.0000	0.0000	117.6667	325.6519	527.3756	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)

Space heating fuel (main heating system)
502.2714 368.9644 255.2613 101.4286 24.3770 0.0000 0.0000 0.0000 0.0000 117.6667 325.6519 527.3756 (211)
Space heating efficiency (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (212)
Space heating fuel (main heating system 2)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (213)
Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
246.3460 217.3932 229.7811 199.2407 191.2433 170.2665 166.5441 174.3088 177.4959 200.3908 216.0975 243.2903 (64)
Efficiency of water heater 324.5200 (216)
(217)m 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 (217)
Fuel for water heating, kWh/month
75.9109 66.9892 70.8064 61.3955 58.9311 52.4672 51.3201 53.7128 54.6949 61.7499 66.5899 74.9693 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 4.8654 4.3946 4.8654 4.7085 4.8654 4.7085 4.8654 4.8654 4.7085 4.8654 4.7085 4.8654 (231)
Lighting 24.2632 19.4648 17.5259 12.8403 9.9182 8.1032 9.0477 11.7605 15.2758 20.0426 22.6381 24.9376 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 2222.9968 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 749.5372 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 57.2867 (230a)
Total electricity for the above, kWh/year 57.2867 (231)
Electricity for lighting (calculated in Appendix L) 195.8180 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 3225.6387 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2222.9968	27.6700	615.1032	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	27.6700	207.3970	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	27.6700	15.8512	(249)
Energy for lighting	195.8180	27.6700	54.1828	(250)
Additional standing charges			0.0000	(251)
Total energy cost			892.5342	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2222.9968	0.1569	348.8199	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			454.6577	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			490.8667	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2222.9968	1.5809	3514.3298	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			4655.2283	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			5042.2438	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 74
Current environmental impact rating: A 94

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: C 74
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£893	£893	£0
Space heating	£631	£631	£0
Water heating	£207	£207	£0
Lighting	£54	£54	£0
Total cost of fuels	£893	£893	£0
Total cost of uses	£892	£892	£0
Delivered energy	36 kWh/m²	36 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300 (1b)	x	2.5500 (2b)	=	225.7515	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	225.7515	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3000	(17)
Infiltration rate		0.1650	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1402	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1788	0.1753	0.1718	0.1543	0.1508	0.1332	0.1332	0.1297	0.1402	0.1508	0.1578	0.1648	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.0900	24.7400	38.3500	0.2100	8.0535	110.0000	4218.5000	(29a)
Communal Wall	20.4900	2.1500	18.3400	0.2100	3.8514	110.0000	2017.4000	(29a)
Stairwell Wall	15.5700		15.5700	0.1600	2.4912	110.0000	1712.7000	(29a)
ColdRoof	88.5300		88.5300	0.0900	7.9677	9.0000	796.7700	(30)
Total net area of external elements Aum(A, m2)			187.6800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.2720			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19510.6299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		220.3844 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.8300	0.0380	1.1335
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
P4 Party wall - Roof (insulation at ceiling level)	8.9600	0.1010	0.9050
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9200	0.3300	1.6236
E15 Flat roof with parapet	22.1400	0.3000	6.6420

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		11.7547 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	65.0267 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	(39)
Average = Sum(39)m / 12 =												102.2757	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	(40)
HLP (average)												1.1553	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6051 (42)

Hot water usage for mixer showers

67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)

Hot water usage for baths

29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)

Hot water usage for other uses

41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)

Average daily hot water use (litres/day)		127.3386 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)										Total = Sum(45)m =		2115.0673	
Distribution loss (46)m = 0.15 x (45)m	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)

Water storage loss (or HIU loss):		
Store volume		200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.6100 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
									Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)													
	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains													
	583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	36.7938	0.3300	0.0000	0.7700	22.9993	(77)
East	16.8600	19.6403	0.3300	0.0000	0.7700	84.1414	(76)
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)

Solar gains	157.8139	290.0900	442.7732	608.0881	722.7995	732.5483	700.2704	614.6251	501.1839	334.0048	193.1572	132.2421	(83)
Total gains	741.6769	871.9844	1005.9722	1136.1045	1215.6574	1193.5049	1142.2328	1059.4965	963.9459	828.8565	726.8638	699.9454	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	
alpha	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	
util living area													
	0.9870	0.9728	0.9373	0.8524	0.7070	0.5316	0.3905	0.4377	0.6740	0.9048	0.9761	0.9898	(86)
MIT	19.6975	19.9346	20.2792	20.6409	20.8777	20.9731	20.9946	20.9911	20.9253	20.5813	20.0496	19.6315	(87)
Th 2	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	(88)
util rest of house													
	0.9834	0.9656	0.9211	0.8173	0.6477	0.4516	0.2996	0.3415	0.5920	0.8727	0.9684	0.9870	(89)
MIT 2	18.4629	18.7608	19.1859	19.6097	19.8583	19.9409	19.9542	19.9527	19.9076	19.5561	18.9096	18.3794	(90)
Living area fraction										fLA = Living area / (4) =		0.3189	(91)
MIT	18.8566	19.1351	19.5345	19.9385	20.1834	20.2700	20.2860	20.2838	20.2321	19.8830	19.2731	18.7787	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8566	19.1351	19.5345	19.9385	20.1834	20.2700	20.2860	20.2838	20.2321	19.8830	19.2731	18.7787	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9782	0.9583	0.9132	0.8167	0.6613	0.4762	0.3286	0.3722	0.6149	0.8701	0.9618	0.9825	(94)
Useful gains	725.5187	835.6018	918.6969	927.8189	803.9277	568.3813	375.3200	394.3007	592.7438	721.2009	699.0638	687.7043	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1488.7825	1455.9053	1333.1174	1128.9726	867.6419	579.9067	376.9839	397.2226	627.1643	949.4247	1245.0162	1491.0431	(97)
Space heating kWh													
	567.8682	416.8440	308.3288	144.8307	47.4033	0.0000	0.0000	0.0000	0.0000	169.7985	393.0857	597.6841	(98a)
Space heating requirement - total per year (kWh/year)												2645.8433	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	567.8682	416.8440	308.3288	144.8307	47.4033	0.0000	0.0000	0.0000	0.0000	169.7985	393.0857	597.6841	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2645.8433	
Space heating per m2											(98c) / (4) =	29.8864	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	567.8682	416.8440	308.3288	144.8307	47.4033	0.0000	0.0000	0.0000	0.0000	169.7985	393.0857	597.6841	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	567.8682	416.8440	308.3288	144.8307	47.4033	0.0000	0.0000	0.0000	0.0000	169.7985	393.0857	597.6841	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2645.8433	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	749.5372	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	57.2867	(230a)
Total electricity for the above, kWh/year	57.2867	(231)
Electricity for lighting (calculated in Appendix L)	195.8180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3648.4852	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2645.8433	16.4900	436.2996	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	16.4900	123.5987	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	16.4900	9.4466	(249)
Energy for lighting	195.8180	16.4900	32.2904	(250)
Additional standing charges			0.0000	(251)
Total energy cost			601.6352	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6220	(257)
SAP value		73.7070	
SAP rating (Section 12)		74	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2645.8433	0.1562	413.2709	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			519.1088	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			555.3177	(272)
CO2 emissions per m2			6.2700	(273)
EI value			94.4273	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	88.5300	(1b) x	2.5500	(2b) =	225.7515	(1b) - (3b)

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 88.5300 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 225.7515 (5)

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2. Ventilation rate
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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3000	(17)
Infiltration rate		0.1650	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1402	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1508	0.1438	0.1438	0.1332	0.1367	0.1192	0.1192	0.1157	0.1192	0.1332	0.1297	0.1402	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			2.4600	1.1450	2.8168			(27)
Window			22.2800	1.1450	25.5115			(27)
Brickwork	63.0900	24.7400	38.3500	0.2100	8.0535	110.0000	4218.5000	(29a)
Communal Wall	20.4900	2.1500	18.3400	0.2100	3.8514	110.0000	2017.4000	(29a)
Stairwell Wall	15.5700		15.5700	0.1600	2.4912	110.0000	1712.7000	(29a)
ColdRoof	88.5300		88.5300	0.0900	7.9677	9.0000	796.7700	(30)
Total net area of external elements Aum(A, m2)			187.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.2720			(33)
Main dwelling								
Party Wall 1			25.8000	0.0000	0.0000	110.0000	2837.9999	(32)
Party Floor 1			88.5300			70.0000	6197.1000	(32d)
Internal Wall 1			192.2400			9.0000	1730.1600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19510.6299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 220.3844 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	29.8300	0.0380	1.1335
E16 Corner (normal)	11.4000	0.0540	0.6156
E17 Corner (inverted - internal area greater than external area)	5.7000	-0.0970	-0.5529
E18 Party wall between dwellings	5.7000	0.0380	0.2166
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.9600	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.3300	0.0500	0.5665
E4 Jamb	37.8000	0.0160	0.6048
P4 Party wall - Roof (insulation at ceiling level)	8.9600	0.1010	0.9050
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.9200	0.3300	1.6236
E15 Flat roof with parapet	22.1400	0.3000	6.6420

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7547 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.0267 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	37.2490	(38)
Heat transfer coeff	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	102.2757	(39)
Average = Sum(39)m / 12 =												102.2757	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	1.1553	(40)
HLP (average)												1.1553	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6051 (42)

Hot water usage for mixer showers	67.8980	66.8777	65.3908	62.5459	60.4464	58.1051	56.7743	58.2500	59.8675	62.3814	65.2874	67.6379	(42a)
Hot water usage for baths	29.3216	28.8861	28.2729	27.1422	26.2956	25.3568	24.8497	25.4586	26.1217	27.1262	28.2802	29.2225	(42b)
Hot water usage for other uses	41.3084	39.8063	38.3042	36.8020	35.2999	33.7978	33.7978	35.2999	36.8020	38.3042	39.8063	41.3084	(42c)
Average daily hot water use (litres/day)												127.3386	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Daily hot water use

	138.5281	135.5701	131.9679	126.4902	122.0419	117.2597	115.4218	119.0085	122.7913	127.8118	133.3739	138.1688	(44)
Energy conte	219.3946	193.0500	202.8297	173.1587	164.2919	144.1845	139.5927	147.3574	151.4139	173.4394	190.0155	216.3389	(45)
Energy content (annual)											Total = Sum(45)m =	2115.0673	
Distribution loss (46)m = 0.15 x (45)m													
	32.9092	28.9575	30.4245	25.9738	24.6438	21.6277	20.9389	22.1036	22.7121	26.0159	28.5023	32.4508	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
										Total per year (kWh/year) = Sum(64)m =		2432.3983	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	72.9487	64.1891	67.4409	57.5753	54.6271	47.9413	46.4146	48.9963	50.3451	57.6686	63.1802	71.9327	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	156.3036	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7201	24.6207	20.0229	15.1586	11.3313	9.5663	10.3367	13.4361	18.0339	22.8982	26.7256	28.4905	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	352.7570	356.4175	347.1931	327.5555	302.7666	279.4684	263.9039	260.2433	269.4677	289.1053	313.8943	337.1924	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	53.2354	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	-104.2024	(71)
Water heating gains (Table 5)													
	98.0493	95.5195	90.6463	79.9657	73.4235	66.5852	62.3852	65.8553	69.9238	77.5115	87.7502	96.6837	(72)
Total internal gains													
	583.8630	581.8944	563.1990	528.0164	492.8579	460.9566	441.9624	444.8714	462.7620	494.8517	533.7067	567.7032	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	2.4600	43.0593	0.3300	0.0000	0.7700	26.9158	(77)
East	16.8600	23.8018	0.3300	0.0000	0.7700	101.9698	(76)
Southeast	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(77)

Solar gains	188.1877	302.5209	458.9184	640.7489	742.9149	796.9067	754.0877	677.9214	554.0398	374.0043	226.9565	158.5693	(83)
Total gains	772.0507	884.4153	1022.1173	1168.7653	1235.7728	1257.8633	1196.0501	1122.7928	1016.8018	868.8559	760.6631	726.2725	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	52.9903	
alpha	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	4.5327	
util living area													
	0.9818	0.9658	0.9198	0.8071	0.6299	0.4178	0.2815	0.3087	0.5777	0.8618	0.9643	0.9855	(86)
MIT	19.8413	20.0516	20.3984	20.7439	20.9332	20.9917	20.9990	20.9984	20.9649	20.7027	20.2045	19.7850	(87)
Th 2	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	19.9560	(88)
util rest of house													
	0.9766	0.9565	0.8989	0.7633	0.5616	0.3363	0.1928	0.2144	0.4876	0.8174	0.9526	0.9813	(89)
MIT 2	18.6452	18.9077	19.3302	19.7224	19.9086	19.9524	19.9558	19.9557	19.9370	19.6911	19.1028	18.5745	(90)
Living area fraction										fLA = Living area / (4) =		0.3189	(91)
MIT	19.0266	19.2724	19.6708	20.0482	20.2354	20.2838	20.2884	20.2882	20.2648	20.0136	19.4541	18.9605	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0266	19.2724	19.6708	20.0482	20.2354	20.2838	20.2884	20.2882	20.2648	20.0136	19.4541	18.9605	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9705	0.9487	0.8922	0.7675	0.5806	0.3622	0.2212	0.2446	0.5152	0.8201	0.9455	0.9759	(94)
Useful gains	749.2563	839.0779	911.9122	897.0373	717.4640	455.5656	264.5105	274.5810	523.8262	712.5849	719.1862	708.7509	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1424.3522	1388.1320	1255.0053	1037.9103	750.2288	458.5844	264.7321	274.9339	538.4595	870.7391	1171.4805	1417.5891	(97)
Space heating kWh													
	502.2714	368.9644	255.2613	101.4286	24.3770	0.0000	0.0000	0.0000	0.0000	117.6667	325.6519	527.3756	(98a)
Space heating requirement - total per year (kWh/year)												2222.9968	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

502.2714	368.9644	255.2613	101.4286	24.3770	0.0000	0.0000	0.0000	0.0000	117.6667	325.6519	527.3756	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2222.9968

Space heating per m2 (98c) / (4) = 25.1101 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	502.2714	368.9644	255.2613	101.4286	24.3770	0.0000	0.0000	0.0000	0.0000	117.6667	325.6519	527.3756	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	502.2714	368.9644	255.2613	101.4286	24.3770	0.0000	0.0000	0.0000	0.0000	117.6667	325.6519	527.3756	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	246.3460	217.3932	229.7811	199.2407	191.2433	170.2665	166.5441	174.3088	177.4959	200.3908	216.0975	243.2903	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	75.9109	66.9892	70.8064	61.3955	58.9311	52.4672	51.3201	53.7128	54.6949	61.7499	66.5899	74.9693	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	4.8654	4.3946	4.8654	4.7085	4.8654	4.7085	4.8654	4.8654	4.7085	4.8654	4.7085	4.8654	(231)
Lighting	24.2632	19.4648	17.5259	12.8403	9.9182	8.1032	9.0477	11.7605	15.2758	20.0426	22.6381	24.9376	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 2222.9968 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 749.5372 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 57.2867 (230a)
Total electricity for the above, kWh/year 57.2867 (231)
Electricity for lighting (calculated in Appendix L) 195.8180 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 3225.6387 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2222.9968	27.6700	615.1032	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	27.6700	207.3970	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	57.2867	27.6700	15.8512	(249)
Energy for lighting	195.8180	27.6700	54.1828	(250)
Additional standing charges			0.0000	(251)
Total energy cost			892.5342	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2222.9968	0.1569	348.8199	(261)

Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	749.5372	0.1412	105.8379	(264)
Space and water heating			454.6577	(265)
Pumps, fans and electric keep-hot	57.2867	0.1387	7.9464	(267)
Energy for lighting	195.8180	0.1443	28.2626	(268)
Total CO2, kg/year			490.8667	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2222.9968	1.5809	3514.3298	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	749.5372	1.5221	1140.8986	(278)
Space and water heating			4655.2283	(279)
Pumps, fans and electric keep-hot	57.2867	1.5128	86.6633	(281)
Energy for lighting	195.8180	1.5338	300.3522	(282)
Total Primary energy kWh/year			5042.2438	(286)

Summary for Input Data

elmhurst energy

Plot Reference	P-49	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-49
Plot Address	Flat 17, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.90	**TER**	16.67
Environmental	95 A	**% DER < TER**			58.61
CO_2 Emissions (t/year)	0.31	**DFEE**	38.19	**TFEE**	45.35
Compliance Check	See BREL	**% DFEE < TFEE**			15.78
% DPER < TPER	19.99	**DPER**	71.06	**TPER**	88.82

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	254.67	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	22.17 m	54.26 m²	2.55 m

8.0 Living Area	25.56	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	45.40	32.70	0.00	None	12.70	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	6.38	4.32	0.70	Stairwell Access Corridor 3	2.06	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	39.84	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	119.55

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
ColdRoof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	54.26	54.26	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	54.26

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Patio Door	Brickwork	South East	5.42	
West	Window	Brickwork	West	7.27	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	22.17	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	5.70	0.05	0.05	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.85	-0.10	-0.10	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	8.55	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	13.84	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	8.37	0.05	0.05		No
E4 Jamb	Gov Approved Scheme	20.29	0.02	0.02	RCD	No
E15 Flat roof with parapet	Table K1 - Default	22.17	0.30	0.30		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	13.84	0.10	0.10	RCD	No

Y-value	0.09	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0
21.0 Fixed Cooling System	No
22.0 Pressure Testing	Yes

Summary for Input Data

elmhurst energy

Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.83	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	10
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	

25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	

26.0 Heat Networks	None

27.0 Secondary Heating	None

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	200.00	L

Summary for Input Data

Loss	1.61	kWh/day

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-49	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-49
Plot Address	Flat 17, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.90	**TER**	16.67
Environmental	95 A	**% DER < TER**			58.61
CO_2 Emissions (t/year)	0.31	**DFEE**	38.19	**TFEE**	45.35
Compliance Check	See BREL	**% DFEE < TFEE**			15.78
% DPER < TPER	19.99	**DPER**	71.06	**TPER**	88.82

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.2600	(1b)	x 2.5500	(2b) =	138.3630	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		138.3630	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8300	(17)
Infiltration rate		0.1415	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1203	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1534	0.1503	0.1473	0.1323	0.1293	0.1143	0.1143	0.1113	0.1203	0.1293	0.1353	0.1413	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.2700	1.1450	8.3244			(27)
Brickwork	45.4000	12.6900	32.7100	0.2100	6.8691	110.0000	3598.1002	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2100	0.9072	110.0000	475.2000	(29a)
ColdRoof	54.2600		54.2600	0.0900	4.8834	9.0000	488.3400	(30)
Total net area of external elements Aum(A, m2)			106.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6622			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			54.2600			70.0000	3798.2000	(32d)
Internal Wall 1			119.5500			9.0000	1075.9500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13818.1902	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							254.6662	(35)
List of Thermal Bridges								

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425
E16 Corner (normal)	5.7000	0.0540	0.3078
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	8.5500	0.0380	0.3249
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.3700	0.0500	0.4185
E4 Jamb	20.2900	0.0160	0.3246
E15 Flat roof with parapet	22.1700	0.3000	6.6510
P4 Party wall - Roof (insulation at ceiling level)	13.8400	0.1010	1.3978

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9907 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.6529 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	(38)
Heat transfer coeff	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	(39)
Average = Sum(39)m / 12 =												62.4828	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	(40)
HLP (average)												1.1515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8156 (42)
Hot water usage for mixer showers

54.6619	53.8405	52.6434	50.3531	48.6629	46.7781	45.7067	46.8947	48.1969	50.2207	52.5602	54.4525	(42a)

Hot water usage for baths

23.6296	23.2787	22.7845	21.8733	21.1910	20.4345	20.0258	20.5166	21.0509	21.8604	22.7904	23.5498	(42b)

Hot water usage for other uses

33.2240	32.0159	30.8077	29.5996	28.3914	27.1833	27.1833	28.3914	29.5996	30.8077	32.0159	33.2240	(42c)

Average daily hot water use (litres/day) 102.5085 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5156	109.1351	106.2357	101.8260	98.2454	94.3958	92.9158	95.8027	98.8474	102.8888	107.3665	111.2263	(44)
Energy conte	176.6135	155.4069	163.2803	139.3948	132.2572	116.0707	112.3736	118.6237	121.8887	139.6192	152.9632	174.1535	(45)
Energy content (annual)											Total = Sum(45)m =	1702.6452	

Distribution loss (46)m = 0.15 x (45)m

26.4920	23.3110	24.4920	20.9092	19.8386	17.4106	16.8560	17.7936	18.2833	20.9429	22.9445	26.1230	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(64)
										Total per year (kWh/year) = Sum(64)m =	2019.9762	(64)
12Total per year (kWh/year)											2020	(64)	
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)	

Heat gains from water heating, kWh/month

58.7240	51.6728	54.2907	46.3488	43.9755	38.5935	37.3642	39.4424	40.5280	46.4234	50.8603	57.9060	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.8323	88.3858	79.8323	82.4934	79.8323	82.4934	79.8323	79.8323	82.4934	79.8323	82.4934	79.8323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.2765	159.9189	155.7801	146.9690	135.8466	125.3931	118.4095	116.7671	120.9059	129.7170	140.8394	151.2929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	(71)
Water heating gains (Table 5)	78.9301	76.8940	72.9714	64.3733	59.1069	53.6021	50.2207	53.0140	56.2889	62.3970	70.6393	77.8307	(72)
Total internal gains	367.2736	375.4334	358.8185	344.0704	325.0205	311.7233	298.6973	299.8481	309.9229	322.1811	344.2068	359.1906	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)
West	7.2700	19.6403	0.3300	0.0000	0.7700	36.2816	(80)

Solar gains 86.9549	157.2898	234.9853	316.8018	372.8211	376.5826	360.4853	318.6642	263.8197	179.6141	105.9338	73.2020	(83)

Total gains	454.2285	532.7233	593.8038	660.8722	697.8416	688.3059	659.1826	618.5123	573.7426	501.7951	450.1406	432.3926	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	
alpha	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	
util living area													
	0.9918	0.9812	0.9567	0.8867	0.7512	0.5651	0.4142	0.4596	0.6986	0.9231	0.9828	0.9936	(86)
MIT	19.8459	20.0594	20.3423	20.6690	20.8893	20.9787	20.9964	20.9939	20.9410	20.6367	20.1706	19.7931	(87)
Th 2	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	(88)
util rest of house													
	0.9892	0.9753	0.9433	0.8540	0.6903	0.4800	0.3178	0.3583	0.6130	0.8927	0.9763	0.9915	(89)
MIT 2	18.6375	18.9066	19.2576	19.6427	19.8732	19.9479	19.9579	19.9570	19.9231	19.6173	19.0499	18.5704	(90)
Living area fraction									fLA = Living area / (4) =			0.4711	(91)
MIT	19.2067	19.4496	19.7686	20.1262	20.3518	20.4335	20.4471	20.4455	20.4026	20.0975	19.5778	19.1464	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2067	19.4496	19.7686	20.1262	20.3518	20.4335	20.4471	20.4455	20.4026	20.0975	19.5778	19.1464	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9866	0.9717	0.9404	0.8598	0.7144	0.5196	0.3633	0.4061	0.6512	0.8974	0.9733	0.9893	(94)
Useful gains	448.1581	517.6623	558.4100	568.2159	498.5615	357.6298	239.4806	251.2007	373.6175	450.3085	438.1362	427.7598	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	931.4141	909.1028	829.0569	701.4423	540.5915	364.4927	240.3769	252.7719	393.8057	593.4316	779.6505	933.8917	(97)
Space heating kWh													
	359.5425	263.0480	201.3613	95.9230	31.2703	0.0000	0.0000	0.0000	0.0000	106.4837	245.8903	376.5621	(98a)
Space heating requirement - total per year (kWh/year)												1680.0811	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	359.5425	263.0480	201.3613	95.9230	31.2703	0.0000	0.0000	0.0000	0.0000	106.4837	245.8903	376.5621	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1680.0811	
Space heating per m2											(98c) / (4) =	30.9635	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	359.5425	263.0480	201.3613	95.9230	31.2703	0.0000	0.0000	0.0000	0.0000	106.4837	245.8903	376.5621	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	359.5425	263.0480	201.3613	95.9230	31.2703	0.0000	0.0000	0.0000	0.0000	106.4837	245.8903	376.5621	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	62.7280	55.3895	58.6194	50.9912	49.0597	43.8040	42.9327	44.8586	45.5968	51.3283	55.1723	61.9699	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.9820	2.6934	2.9820	2.8858	2.9820	2.8858	2.9820	2.9820	2.8858	2.9820	2.8858	2.9820	(231)
Lighting	16.4891	13.2282	11.9105	8.7262	6.7403	5.5069	6.1488	7.9924	10.3813	13.6209	15.3847	16.9474	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1680.0811	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												622.4505	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)

mechanical ventilation fans (SFP = 0.2080)	35.1110	(230a)
Total electricity for the above, kWh/year	35.1110	(231)
Electricity for lighting (calculated in Appendix L)	133.0769	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2470.7194	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1680.0811	0.1561	262.3369	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	622.4505	0.1411	87.8451	(264)
Space and water heating			350.1820	(265)
Pumps, fans and electric keep-hot	35.1110	0.1387	4.8703	(267)
Energy for lighting	133.0769	0.1443	19.2071	(268)
Total CO2, kg/year			374.2594	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.9000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1680.0811	1.5781	2651.2722	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	622.4505	1.5219	947.2769	(278)
Space and water heating			3598.5491	(279)
Pumps, fans and electric keep-hot	35.1110	1.5128	53.1159	(281)
Energy for lighting	133.0769	1.5338	204.1177	(282)
Total Primary energy kWh/year			3855.7827	(286)
Dwelling Primary energy Rate (DPER)			71.0600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.2600	(1b)	x 2.5500	(2b) =	138.3630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.3630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1445	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3945	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3354	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4276	0.4192	0.4108	0.3689	0.3605	0.3186	0.3186	0.3102	0.3354	0.3605	0.3773	0.3941	(22b)
Effective ac	0.5914	0.5879	0.5844	0.5680	0.5650	0.5508	0.5508	0.5481	0.5562	0.5650	0.5712	0.5776	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.5000	1.1450	13.1679			(27)
Brickwork	45.4000	11.5000	33.9000	0.1800	6.1020			(29a)
Communal Wall	6.3800	2.0600	4.3200	0.1800	0.7776			(29a)
ColdRoof	54.2600		54.2600	0.1100	5.9686			(30)
Total net area of external elements Aum(A, m2)			106.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0761			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 254.6662 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0700	1.5519
E16 Corner (normal)	5.7000	0.0900	0.5130
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E18 Party wall between dwellings	8.5500	0.0600	0.5130
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.3700	0.0500	0.4185
E4 Jamb	20.2900	0.0500	1.0145
E15 Flat roof with parapet	22.1700	0.5600	12.4152
P4 Party wall - Roof (insulation at ceiling level)	13.8400	0.1200	1.6608

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.8304 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 45.9065 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.0040	26.8419	26.6830	25.9368	25.7972	25.1472	25.1472	25.0269	25.3976	25.7972	26.0796	26.3749	(38)
Heat transfer coeff	72.9105	72.7484	72.5895	71.8433	71.7037	71.0538	71.0538	70.9334	71.3041	71.7037	71.9861	72.2814	(39)

Average = Sum(39)m / 12 = 71.8427

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3437	1.3407	1.3378	1.3241	1.3215	1.3095	1.3095	1.3073	1.3141	1.3215	1.3267	1.3321	(40)
HLP (average)												1.3240	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8156 (42)

Hot water usage for mixer showers

54.6619	53.8405	52.6434	50.3531	48.6629	46.7781	45.7067	46.8947	48.1969	50.2207	52.5602	54.4525	(42a)

Hot water usage for baths

23.6296	23.2787	22.7845	21.8733	21.1910	20.4345	20.0258	20.5166	21.0509	21.8604	22.7904	23.5498	(42b)

Hot water usage for other uses

33.2240	32.0159	30.8077	29.5996	28.3914	27.1833	27.1833	28.3914	29.5996	30.8077	32.0159	33.2240	(42c)

Average daily hot water use (litres/day) 102.5085 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5156	109.1351	106.2357	101.8260	98.2454	94.3958	92.9158	95.8027	98.8474	102.8888	107.3665	111.2263	(44)
Energy conte	176.6135	155.4069	163.2803	139.3948	132.2572	116.0707	112.3736	118.6237	121.8887	139.6192	152.9632	174.1535	(45)
Energy content (annual)										Total = Sum(45)m =		1702.6452	
Distribution loss (46)m = 0.15 x (45)m	26.4920	23.3110	24.4920	20.9092	19.8386	17.4106	16.8560	17.7936	18.2833	20.9429	22.9445	26.1230	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	223.2084	197.4926	209.8752	184.4866	178.8521	161.1625	158.9685	165.2186	166.9805	186.2141	198.0550	220.7484	(62)
WWHRS	-24.9892	-22.1006	-23.1425	-19.1629	-17.8591	-15.2822	-14.3246	-15.2328	-15.8115	-18.6401	-21.1169	-24.5264	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	198.2192	175.3920	186.7327	165.3237	160.9930	145.8804	144.6439	149.9858	151.1690	167.5740	176.9381	196.2220	(64)
										Total per year (kWh/year) = Sum(64)m =		2019.0739	(64)
12Total per year (kWh/year)												2019	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	95.9999	85.3414	91.5666	82.4222	81.2514	74.6670	74.6402	76.7183	76.6015	83.6993	86.9337	95.1820	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.0022	88.5739	80.0022	82.6689	80.0022	82.6689	80.0022	80.0022	82.6689	80.0022	82.6689	80.0022	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.2765	159.9189	155.7801	146.9690	135.8466	125.3931	118.4095	116.7671	120.9059	129.7170	140.8394	151.2929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	(71)
Water heating gains (Table 5)	129.0321	126.9961	123.0734	114.4753	109.2089	103.7041	100.3228	103.1160	106.3909	112.4991	120.7413	127.9327	(72)

Total internal gains

	420.5455	428.7236	412.0904	397.3480	378.2924	362.0009	348.9692	350.1200	360.2005	375.4530	397.4844	412.4626 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.9100	36.7938	0.6300	0.7000	0.7700	55.2113	(77)
West	6.5900	19.6403	0.6300	0.7000	0.7700	39.5553	(80)

Solar gains	94.7666	171.4239	256.1084	345.2881	406.3502	410.4519	392.9061	347.3203	287.5379	195.7563	115.4513	79.7778	(83)
Total gains	515.3122	600.1474	668.1988	742.6361	784.6427	772.4528	741.8753	697.4403	647.7384	571.2093	512.9356	492.2403	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.6452	52.7625	52.8779	53.4272	53.5312	54.0209	54.0209	54.1125	53.8312	53.5312	53.3212	53.1034	
alpha	4.5097	4.5175	4.5252	4.5618	4.5687	4.6014	4.6014	4.6075	4.5887	4.5687	4.5547	4.5402	
util living area	0.9880	0.9756	0.9492	0.8783	0.7480	0.5664	0.4168	0.4602	0.6937	0.9105	0.9762	0.9901	(86)
MIT	19.6670	19.8974	20.2121	20.5902	20.8491	20.9674	20.9935	20.9899	20.9193	20.5738	20.0567	19.6295	(87)
Th 2	19.8067	19.8091	19.8113	19.8220	19.8240	19.8334	19.8334	19.8351	19.8298	19.8240	19.8200	19.8158	(88)
util rest of house	0.9841	0.9680	0.9332	0.8420	0.6818	0.4726	0.3087	0.3476	0.6003	0.8749	0.9673	0.9868	(89)
MIT 2	18.3014	18.5924	18.9831	19.4360	19.7088	19.8169	19.8316	19.8321	19.7820	19.4323	18.8042	18.2603	(90)
Living area fraction										fLA = Living area / (4) =		0.4711	(91)
MIT	18.9447	19.2071	19.5620	19.9797	20.2460	20.3589	20.3790	20.3775	20.3177	19.9700	19.3942	18.9053	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9447	19.2071	19.5620	19.9797	20.2460	20.3589	20.3790	20.3775	20.3177	19.9700	19.3942	18.9053	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9630	0.9292	0.8474	0.7070	0.5159	0.3598	0.4008	0.6414	0.8800	0.9632	0.9835	(94)
Useful gains	505.1511	577.9594	620.8570	629.3404	554.7535	398.5463	266.9088	279.5255	415.4341	502.6901	494.0427	484.1061	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1067.7516	1040.8198	948.1671	796.0013	612.7773	409.1895	268.5097	282.1382	443.3502	671.8659	885.0118	1062.9187	(97)
Space heating kWh	418.5748	311.0422	243.5187	119.9958	43.1697	0.0000	0.0000	0.0000	0.0000	125.8667	281.4978	430.6365	(98a)
Space heating requirement - total per year (kWh/year)												1974.3022	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	418.5748	311.0422	243.5187	119.9958	43.1697	0.0000	0.0000	0.0000	0.0000	125.8667	281.4978	430.6365	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1974.3022	
Space heating per m2											(98c) / (4) =	36.3860	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	418.5748	311.0422	243.5187	119.9958	43.1697	0.0000	0.0000	0.0000	0.0000	125.8667	281.4978	430.6365	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	453.4938	336.9905	263.8339	130.0063	46.7711	0.0000	0.0000	0.0000	0.0000	136.3670	304.9813	466.5618	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	198.2192	175.3920	186.7327	165.3237	160.9930	145.8804	144.6439	149.9858	151.1690	167.5740	176.9381	196.2220	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6940	85.3300	84.6562	83.3529	81.5476	79.8000	79.8000	79.8000	79.8000	83.4268	85.0958	85.7719	(217)
Fuel for water heating, kWh/month	231.3104	205.5455	220.5777	198.3419	197.4221	182.8075	181.2581	187.9522	189.4348	200.8635	207.9281	228.7718	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.6229	13.3355	12.0071	8.7969	6.7950	5.5516	6.1986	8.0572	10.4655	13.7313	15.5095	17.0849	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.6610	-21.7884	-33.0014	-39.1768	-44.0882	-41.8486	-41.3564	-38.1321	-32.7591	-25.8294	-16.5166	-12.5494	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.2008	-11.1887	-22.7018	-34.7800	-46.6528	-47.1016	-46.5297	-39.0769	-28.2371	-16.2041	-7.0100	-4.0932	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2139.0057	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2432.2133	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	134.1561	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-670.4841	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4120.8911	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2139.0057	0.2100	449.1912	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2432.2133	0.2100	510.7648	(264)
Space and water heating			959.9560	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	134.1561	0.1443	19.3629	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-361.7074	0.1335	-48.2792	
PV Unit electricity exported	-308.7767	0.1253	-38.6985	
Total			-86.9777	(269)
Total CO2, kg/year			904.2704	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.6700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2139.0057	1.1300	2417.0764	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2432.2133	1.1300	2748.4011	(278)
Space and water heating			5165.4775	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	134.1561	1.5338	205.7732	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-361.7074	1.4932	-540.1162	
PV Unit electricity exported	-308.7767	0.4600	-142.0421	
Total			-682.1583	(283)
Total Primary energy kWh/year			4819.1932	(286)
Target Primary Energy Rate (TPER)			88.8200	(287)

Full SAP Calculation Printout

Plot Reference	P-49	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-49
Plot Address	Flat 17, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.90	**TER**	16.67
Environmental	95 A	**% DER < TER**			58.61
CO_2 Emissions (t/year)	0.31	**DFEE**	38.19	**TFEE**	45.35
Compliance Check	See BREL	**% DFEE < TFEE**			15.78
% DPER < TPER	19.99	**DPER**	71.06	**TPER**	88.82

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.2600 (1b)	x	2.5500 (2b)	=	138.3630	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.3630	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1445	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8300	(17)
Infiltration rate		0.2860	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2431	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3100	0.3039	0.2978	0.2675	0.2614	0.2310	0.2310	0.2249	0.2431	0.2614	0.2735	0.2857	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5481	0.5462	0.5444	0.5358	0.5342	0.5267	0.5267	0.5253	0.5296	0.5342	0.5374	0.5408	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.2700	1.1450	8.3244			(27)
Brickwork	45.4000	12.6900	32.7100	0.2100	6.8691	110.0000	3598.1002	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2100	0.9072	110.0000	475.2000	(29a)
ColdRoof	54.2600		54.2600	0.0900	4.8834	9.0000	488.3400	(30)
Total net area of external elements Aum(A, m2)			106.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6622			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			54.2600			70.0000	3798.2000	(32d)
Internal Wall 1			119.5500			9.0000	1075.9500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13818.1902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		254.6662 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425

E16 Corner (normal)	5.7000	0.0540	0.3078	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765	
E18 Party wall between dwellings	8.5500	0.0380	0.3249	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.3700	0.0500	0.4185	
E4 Jamb	20.2900	0.0160	0.3246	
E15 Flat roof with parapet	22.1700	0.3000	6.6510	
P4 Party wall - Roof (insulation at ceiling level)	13.8400	0.1010	1.3978	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9907 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.6529 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.0239	24.9387	24.8552	24.4630	24.3896	24.0479	24.0479	23.9847	24.1795	24.3896	24.5380	24.6932	(38)
Heat transfer coeff	64.6768	64.5916	64.5081	64.1159	64.0425	63.7009	63.7009	63.6376	63.8325	64.0425	64.1910	64.3462	(39)
Average = Sum(39)m / 12 =												64.1155	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1920	1.1904	1.1889	1.1816	1.1803	1.1740	1.1740	1.1728	1.1764	1.1803	1.1830	1.1859	(40)
HLP (average)												1.1816	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8156 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.6296	23.2787	22.7845	21.8733	21.1910	20.4345	20.0258	20.5166	21.0509	21.8604	22.7904	23.5498	(42b)

Hot water usage for other uses

33.2240	32.0159	30.8077	29.5996	28.3914	27.1833	27.1833	28.3914	29.5996	30.8077	32.0159	33.2240	(42c)

Average daily hot water use (litres/day) 52.1121 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.8537	55.2946	53.5923	51.4729	49.5825	47.6178	47.2091	48.9080	50.6505	52.6682	54.8063	56.7738	(44)
Energy conte	90.0423	78.7388	82.3693	70.4639	66.7476	58.5516	57.0954	60.5583	62.4571	71.4702	78.0816	88.8940	(45)
Energy content (annual)										Total = Sum(45)m =		865.4700	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

76.5360	66.9279	70.0139	59.8943	56.7354	49.7689	48.5310	51.4746	53.0885	60.7497	66.3693	75.5599	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

76.5360	66.9279	70.0139	59.8943	56.7354	49.7689	48.5310	51.4746	53.0885	60.7497	66.3693	75.5599	(64)
									Total per year (kWh/year) = Sum(64)m =		735.6495	(64)
12Total per year (kWh/year)											736	(64)

Electric shower(s)

43.7751	39.0040	42.5908	40.6439	41.4066	39.4979	40.8145	41.4066	40.6439	42.5908	41.7900	43.7751	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							497.9391	(64a)

Heat gains from water heating, kWh/month

30.0778	26.4830	28.1512	25.1345	24.5355	22.3167	22.3364	23.2203	23.4331	25.8351	27.0398	29.8338	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.8323	88.3858	79.8323	82.4934	79.8323	82.4934	79.8323	79.8323	82.4934	79.8323	82.4934	79.8323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.2765	159.9189	155.7801	146.9690	135.8466	125.3931	118.4095	116.7671	120.9059	129.7170	140.8394	151.2929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	(71)
Water heating gains (Table 5)	40.4271	39.4092	37.8376	34.9091	32.9778	30.9954	30.0220	31.2101	32.5460	34.7246	37.5553	40.0991	(72)
Total internal gains	328.7706	337.9486	323.6847	314.6062	298.8914	289.1166	278.4985	278.0442	286.1800	294.5087	311.1228	321.4591	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)
West	7.2700	19.6403	0.3300	0.0000	0.7700	36.2816	(80)

Solar gains	86.9549	157.2898	234.9853	316.8018	372.8211	376.5826	360.4853	318.6642	263.8197	179.6141	105.9338	73.2020	(83)
Total gains	415.7255	495.2384	558.6700	631.4080	671.7126	665.6992	638.9839	596.7084	549.9997	474.1227	417.0566	394.6611	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	59.3472	59.4254	59.5024	59.8664	59.9350	60.2564	60.2564	60.3163	60.1322	59.9350	59.7964	59.6521	
alpha	4.9565	4.9617	4.9668	4.9911	4.9957	5.0171	5.0171	5.0211	5.0088	4.9957	4.9864	4.9768	
util living area	0.9946	0.9866	0.9674	0.9061	0.7794	0.5910	0.4347	0.4835	0.7296	0.9393	0.9879	0.9958	(86)
MIT	19.7118	19.9344	20.2364	20.6056	20.8605	20.9724	20.9951	20.9918	20.9242	20.5727	20.0705	19.6691	(87)
Th 2	19.9264	19.9277	19.9289	19.9347	19.9358	19.9409	19.9409	19.9418	19.9389	19.9358	19.9336	19.9313	(88)
util rest of house	0.9928	0.9823	0.9566	0.8767	0.7194	0.5023	0.3322	0.3759	0.6432	0.9135	0.9831	0.9944	(89)
MIT 2	18.7710	18.9918	19.2874	19.6367	19.8502	19.9295	19.9398	19.9397	19.9022	19.6167	19.1328	18.7323	(90)
Living area fraction									fLA = Living area / (4) =			0.4711	(91)
MIT	19.2142	19.4358	19.7344	20.0931	20.3261	20.4208	20.4369	20.4353	20.3836	20.0670	19.5745	19.1736	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2142	19.4358	19.7344	20.0931	20.3261	20.4208	20.4369	20.4353	20.3836	20.0670	19.5745	19.1736	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9912	0.9798	0.9543	0.8816	0.7428	0.5435	0.3806	0.4268	0.6815	0.9172	0.9811	0.9930	(94)
Useful gains	412.0524	485.2253	533.1387	556.6366	498.9206	361.8055	243.1934	254.6639	374.8197	434.8804	409.1707	391.9048	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	964.6021	938.8930	853.7284	717.6567	552.4371	370.7896	244.4127	256.7987	401.0988	606.2932	800.7503	963.4931	(97)
Space heating kWh	411.0970	304.8647	238.5187	115.9344	39.8163	0.0000	0.0000	0.0000	0.0000	127.5311	281.9373	425.2617	(98a)
Space heating requirement - total per year (kWh/year)												1944.9612	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	411.0970	304.8647	238.5187	115.9344	39.8163	0.0000	0.0000	0.0000	0.0000	127.5311	281.9373	425.2617	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1944.9612	
Space heating per m2											(98c) / (4) =	35.8452	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	598.7882	471.3864	483.6458	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9119	0.9552	0.9376	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	546.0629	450.2647	453.4543	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	749.3182	719.6691	671.7870	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	146.3438	200.4369	162.4395	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.5859	50.1092	40.6099	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												127.3050	(107)
Energy for space heating												35.8452	(99)
Energy for space cooling												2.3462	(108)
Total												38.1914	(109)
Fabric Energy Efficiency (DFEE)												38.2	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		54.2600	(1b)	x 2.5500	(2b) =	138.3630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.2600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		138.3630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1445	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3945	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3354	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4276	0.4192	0.4108	0.3689	0.3605	0.3186	0.3186	0.3102	0.3354	0.3605	0.3773	0.3941	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5914	0.5879	0.5844	0.5680	0.5650	0.5508	0.5508	0.5481	0.5562	0.5650	0.5712	0.5776	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.5000	1.1450	13.1679			(27)
Brickwork	45.4000	11.5000	33.9000	0.1800	6.1020			(29a)
Communal Wall	6.3800	2.0600	4.3200	0.1800	0.7776			(29a)
ColdRoof	54.2600		54.2600	0.1100	5.9686			(30)
Total net area of external elements Aum(A, m2)			106.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0761			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	254.6662 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0700	1.5519
E16 Corner (normal)	5.7000	0.0900	0.5130
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E18 Party wall between dwellings	8.5500	0.0600	0.5130
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.3700	0.0500	0.4185
E4 Jamb	20.2900	0.0500	1.0145
E15 Flat roof with parapet	22.1700	0.5600	12.4152
P4 Party wall - Roof (insulation at ceiling level)	13.8400	0.1200	1.6608

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	17.8304	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	45.9065	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.0040	26.8419	26.6830	25.9368	25.7972	25.1472	25.1472	25.0269	25.3976	25.7972	26.0796	26.3749	(38)
Heat transfer coeff	72.9105	72.7484	72.5895	71.8433	71.7037	71.0538	71.0538	70.9334	71.3041	71.7037	71.9861	72.2814	(39)
Average = Sum(39)m / 12 =												71.8427	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3437	1.3407	1.3378	1.3241	1.3215	1.3095	1.3095	1.3073	1.3141	1.3215	1.3267	1.3321	(40)
HLP (average)												1.3240	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8156	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.6296	23.2787	22.7845	21.8733	21.1910	20.4345	20.0258	20.5166	21.0509	21.8604	22.7904	23.5498	(42b)

Hot water usage for other uses

33.2240	32.0159	30.8077	29.5996	28.3914	27.1833	27.1833	28.3914	29.5996	30.8077	32.0159	33.2240	(42c)

Average daily hot water use (litres/day)	52.1121	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.8537	55.2946	53.5923	51.4729	49.5825	47.6178	47.2091	48.9080	50.6505	52.6682	54.8063	56.7738	(44)
Energy conte	90.0423	78.7388	82.3693	70.4639	66.7476	58.5516	57.0954	60.5583	62.4571	71.4702	78.0816	88.8940	(45)
Energy content (annual) Total = Sum(45)m =												865.4700	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	76.5360	66.9279	70.0139	59.8943	56.7354	49.7689	48.5310	51.4746	53.0885	60.7497	66.3693	75.5599	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	76.5360	66.9279	70.0139	59.8943	56.7354	49.7689	48.5310	51.4746	53.0885	60.7497	66.3693	75.5599	(64)
Total per year (kWh/year) = Sum(64)m =												735.6495	(64)
12Total per year (kWh/year)												736	(64)
Electric shower(s)	43.7751	39.0040	42.5908	40.6439	41.4066	39.4979	40.8145	41.4066	40.6439	42.5908	41.7900	43.7751	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												497.9391	(64a)
Heat gains from water heating, kWh/month	30.0778	26.4830	28.1512	25.1345	24.5355	22.3167	22.3364	23.2203	23.4331	25.8351	27.0398	29.8338	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	80.0022	88.5739	80.0022	82.6689	80.0022	82.6689	80.0022	80.0022	82.6689	80.0022	82.6689	80.0022	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	158.2765	159.9189	155.7801	146.9690	135.8466	125.3931	118.4095	116.7671	120.9059	129.7170	140.8394	151.2929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	(71)
Water heating gains (Table 5)													
	40.4271	39.4092	37.8376	34.9091	32.9778	30.9954	30.0220	31.2101	32.5460	34.7246	37.5553	40.0991	(72)
Total internal gains													
	328.9405	338.1367	323.8546	314.7817	299.0613	289.2921	278.6684	278.2141	286.3556	294.6785	311.2984	321.6290	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.9100	36.7938	0.6300	0.7000	0.7700	55.2113	(77)
West	6.5900	19.6403	0.6300	0.7000	0.7700	39.5553	(80)

Solar gains	94.7666	171.4239	256.1084	345.2881	406.3502	410.4519	392.9061	347.3203	287.5379	195.7563	115.4513	79.7778	(83)
Total gains	423.7071	509.5606	579.9630	660.0699	705.4116	699.7440	671.5746	625.5344	573.8935	490.4348	426.7496	401.4067	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.6452	52.7625	52.8779	53.4272	53.5312	54.0209	54.0209	54.1125	53.8312	53.5312	53.3212	53.1034	
alpha	4.5097	4.5175	4.5252	4.5618	4.5687	4.6014	4.6014	4.6075	4.5887	4.5687	4.5547	4.5402	
util living area													
	0.9944	0.9867	0.9686	0.9125	0.7966	0.6155	0.4580	0.5089	0.7527	0.9441	0.9881	0.9956	(86)
MIT	19.5018	19.7417	20.0756	20.4960	20.8019	20.9544	20.9905	20.9849	20.8865	20.4661	19.9075	19.4641	(87)
Th 2	19.8067	19.8091	19.8113	19.8220	19.8240	19.8334	19.8334	19.8351	19.8298	19.8240	19.8200	19.8158	(88)
util rest of house													
	0.9925	0.9823	0.9578	0.8832	0.7343	0.5174	0.3405	0.3864	0.6612	0.9187	0.9833	0.9941	(89)
MIT 2	18.4707	18.7095	19.0377	19.4413	19.7021	19.8149	19.8313	19.8315	19.7747	19.4258	18.8839	18.4401	(90)
Living area fraction									fLA = Living area / (4) =			0.4711	(91)
MIT	18.9565	19.1957	19.5266	19.9381	20.2202	20.3517	20.3774	20.3748	20.2984	19.9158	19.3661	18.9225	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9565	19.1957	19.5266	19.9381	20.2202	20.3517	20.3774	20.3748	20.2984	19.9158	19.3661	18.9225	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9906	0.9793	0.9546	0.8865	0.7569	0.5625	0.3961	0.4444	0.7006	0.9211	0.9808	0.9925	(94)
Useful gains	419.7386	499.0001	553.6482	585.1619	533.9441	393.6252	266.0146	277.9608	402.0572	451.7340	418.5683	398.4044	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1068.6099	1039.9921	945.5957	793.0145	610.9276	408.6791	268.3965	281.9453	441.9744	667.9809	882.9882	1064.1605	(97)
Space heating kWh													
	482.7602	363.5466	291.6089	149.6538	57.2757	0.0000	0.0000	0.0000	0.0000	160.8877	334.3823	495.3225	(98a)
Space heating requirement - total per year (kWh/year)												2335.4379	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	482.7602	363.5466	291.6089	149.6538	57.2757	0.0000	0.0000	0.0000	0.0000	160.8877	334.3823	495.3225	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2335.4379	
Space heating per m2										(98c) / (4) =		43.0416	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	667.9053	525.7978	539.0938	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8825	0.9345	0.9122	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	589.3985	491.3809	491.7802	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	788.9206	757.5796	705.3021	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	143.6559	198.0519	158.8603	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	35.9140	49.5130	39.7151	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.1420	(107)
Energy for space heating												43.0416	(99)
Energy for space cooling												2.3063	(108)
Total												45.3480	(109)
Fabric Energy Efficiency (TFEE)												45.3	(109)

Full SAP Calculation Printout

Plot Reference	P-49	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-49
Plot Address	Flat 17, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.90	**TER**	16.67
Environmental	95 A	**% DER < TER**			58.61
CO_2 Emissions (t/year)	0.31	**DFEE**	38.19	**TFEE**	45.35
Compliance Check	See BREL	**% DFEE < TFEE**			15.78
% DPER < TPER	19.99	**DPER**	71.06	**TPER**	88.82

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.2600	(1b)	x 2.5500	(2b) =	138.3630	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.2600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		138.3630	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8300	(17)
Infiltration rate		0.1415	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1203	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1534	0.1503	0.1473	0.1323	0.1293	0.1143	0.1143	0.1113	0.1203	0.1293	0.1353	0.1413	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.2700	1.1450	8.3244			(27)
Brickwork	45.4000	12.6900	32.7100	0.2100	6.8691	110.0000	3598.1002	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2100	0.9072	110.0000	475.2000	(29a)
ColdRoof	54.2600		54.2600	0.0900	4.8834	9.0000	488.3400	(30)
Total net area of external elements Aum(A, m2)			106.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6622			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			54.2600			70.0000	3798.2000	(32d)
Internal Wall 1			119.5500			9.0000	1075.9500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13818.1902	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							254.6662	(35)
List of Thermal Bridges								

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425
E16 Corner (normal)	5.7000	0.0540	0.3078
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	8.5500	0.0380	0.3249
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.3700	0.0500	0.4185
E4 Jamb	20.2900	0.0160	0.3246
E15 Flat roof with parapet	22.1700	0.3000	6.6510
P4 Party wall - Roof (insulation at ceiling level)	13.8400	0.1010	1.3978

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9907 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.6529 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	(38)
Heat transfer coeff	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	(39)
Average = Sum(39)m / 12 =												62.4828	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	(40)
HLP (average)												1.1515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8156 (42)
Hot water usage for mixer showers

54.6619	53.8405	52.6434	50.3531	48.6629	46.7781	45.7067	46.8947	48.1969	50.2207	52.5602	54.4525	(42a)

Hot water usage for baths

23.6296	23.2787	22.7845	21.8733	21.1910	20.4345	20.0258	20.5166	21.0509	21.8604	22.7904	23.5498	(42b)

Hot water usage for other uses

33.2240	32.0159	30.8077	29.5996	28.3914	27.1833	27.1833	28.3914	29.5996	30.8077	32.0159	33.2240	(42c)

Average daily hot water use (litres/day) 102.5085 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5156	109.1351	106.2357	101.8260	98.2454	94.3958	92.9158	95.8027	98.8474	102.8888	107.3665	111.2263	(44)
Energy conte	176.6135	155.4069	163.2803	139.3948	132.2572	116.0707	112.3736	118.6237	121.8887	139.6192	152.9632	174.1535	(45)
Energy content (annual)											Total = Sum(45)m =	1702.6452	

Distribution loss (46)m = 0.15 x (45)m

26.4920	23.3110	24.4920	20.9092	19.8386	17.4106	16.8560	17.7936	18.2833	20.9429	22.9445	26.1230	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(64)
										Total per year (kWh/year) = Sum(64)m =	2019.9762	(64)
12Total per year (kWh/year)											2020	(64)	
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)	

Heat gains from water heating, kWh/month

58.7240	51.6728	54.2907	46.3488	43.9755	38.5935	37.3642	39.4424	40.5280	46.4234	50.8603	57.9060	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.8323	88.3858	79.8323	82.4934	79.8323	82.4934	79.8323	79.8323	82.4934	79.8323	82.4934	79.8323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.2765	159.9189	155.7801	146.9690	135.8466	125.3931	118.4095	116.7671	120.9059	129.7170	140.8394	151.2929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	(71)
Water heating gains (Table 5)	78.9301	76.8940	72.9714	64.3733	59.1069	53.6021	50.2207	53.0140	56.2889	62.3970	70.6393	77.8307	(72)
Total internal gains	367.2736	375.4334	358.8185	344.0704	325.0205	311.7233	298.6973	299.8481	309.9229	322.1811	344.2068	359.1906	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)
West	7.2700	19.6403	0.3300	0.0000	0.7700	36.2816	(80)

Solar gains 86.9549	157.2898	234.9853	316.8018	372.8211	376.5826	360.4853	318.6642	263.8197	179.6141	105.9338	73.2020	(83)

Total gains	454.2285	532.7233	593.8038	660.8722	697.8416	688.3059	659.1826	618.5123	573.7426	501.7951	450.1406	432.3926	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	
alpha	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	
util living area													
	0.9918	0.9812	0.9567	0.8867	0.7512	0.5651	0.4142	0.4596	0.6986	0.9231	0.9828	0.9936	(86)
MIT	19.8459	20.0594	20.3423	20.6690	20.8893	20.9787	20.9964	20.9939	20.9410	20.6367	20.1706	19.7931	(87)
Th 2	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	(88)
util rest of house													
	0.9892	0.9753	0.9433	0.8540	0.6903	0.4800	0.3178	0.3583	0.6130	0.8927	0.9763	0.9915	(89)
MIT 2	18.6375	18.9066	19.2576	19.6427	19.8732	19.9479	19.9579	19.9570	19.9231	19.6173	19.0499	18.5704	(90)
Living area fraction									fLA = Living area / (4) =			0.4711	(91)
MIT	19.2067	19.4496	19.7686	20.1262	20.3518	20.4335	20.4471	20.4455	20.4026	20.0975	19.5778	19.1464	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2067	19.4496	19.7686	20.1262	20.3518	20.4335	20.4471	20.4455	20.4026	20.0975	19.5778	19.1464	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9866	0.9717	0.9404	0.8598	0.7144	0.5196	0.3633	0.4061	0.6512	0.8974	0.9733	0.9893	(94)
Useful gains	448.1581	517.6623	558.4100	568.2159	498.5615	357.6298	239.4806	251.2007	373.6175	450.3085	438.1362	427.7598	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	931.4141	909.1028	829.0569	701.4423	540.5915	364.4927	240.3769	252.7719	393.8057	593.4316	779.6505	933.8917	(97)
Space heating kWh													
	359.5425	263.0480	201.3613	95.9230	31.2703	0.0000	0.0000	0.0000	0.0000	106.4837	245.8903	376.5621	(98a)
Space heating requirement - total per year (kWh/year)												1680.0811	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	359.5425	263.0480	201.3613	95.9230	31.2703	0.0000	0.0000	0.0000	0.0000	106.4837	245.8903	376.5621	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1680.0811	
Space heating per m2											(98c) / (4) =	30.9635	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	359.5425	263.0480	201.3613	95.9230	31.2703	0.0000	0.0000	0.0000	0.0000	106.4837	245.8903	376.5621	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000		(210)
Space heating fuel (main heating system)													
	359.5425	263.0480	201.3613	95.9230	31.2703	0.0000	0.0000	0.0000	0.0000	106.4837	245.8903	376.5621	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	62.7280	55.3895	58.6194	50.9912	49.0597	43.8040	42.9327	44.8586	45.5968	51.3283	55.1723	61.9699	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.9820	2.6934	2.9820	2.8858	2.9820	2.8858	2.9820	2.9820	2.8858	2.9820	2.8858	2.9820	(231)
Lighting	16.4891	13.2282	11.9105	8.7262	6.7403	5.5069	6.1488	7.9924	10.3813	13.6209	15.3847	16.9474	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1680.0811	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												622.4505	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)

mechanical ventilation fans (SFP = 0.2080)	35.1110	(230a)
Total electricity for the above, kWh/year	35.1110	(231)
Electricity for lighting (calculated in Appendix L)	133.0769	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2470.7194	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1680.0811	0.1561	262.3369	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	622.4505	0.1411	87.8451	(264)
Space and water heating			350.1820	(265)
Pumps, fans and electric keep-hot	35.1110	0.1387	4.8703	(267)
Energy for lighting	133.0769	0.1443	19.2071	(268)
Total CO2, kg/year			374.2594	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.9000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1680.0811	1.5781	2651.2722	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	622.4505	1.5219	947.2769	(278)
Space and water heating			3598.5491	(279)
Pumps, fans and electric keep-hot	35.1110	1.5128	53.1159	(281)
Energy for lighting	133.0769	1.5338	204.1177	(282)
Total Primary energy kWh/year			3855.7827	(286)
Dwelling Primary energy Rate (DPER)			71.0600	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.2600	(1b)	x 2.5500	(2b) =	138.3630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.3630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1445	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3945	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3354	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4276	0.4192	0.4108	0.3689	0.3605	0.3186	0.3186	0.3102	0.3354	0.3605	0.3773	0.3941	(22b)
Effective ac	0.5914	0.5879	0.5844	0.5680	0.5650	0.5508	0.5508	0.5481	0.5562	0.5650	0.5712	0.5776	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.5000	1.1450	13.1679			(27)
Brickwork	45.4000	11.5000	33.9000	0.1800	6.1020			(29a)
Communal Wall	6.3800	2.0600	4.3200	0.1800	0.7776			(29a)
ColdRoof	54.2600		54.2600	0.1100	5.9686			(30)
Total net area of external elements Aum(A, m2)			106.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0761			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 254.6662 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0700	1.5519
E16 Corner (normal)	5.7000	0.0900	0.5130
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E18 Party wall between dwellings	8.5500	0.0600	0.5130
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.3700	0.0500	0.4185
E4 Jamb	20.2900	0.0500	1.0145
E15 Flat roof with parapet	22.1700	0.5600	12.4152
P4 Party wall - Roof (insulation at ceiling level)	13.8400	0.1200	1.6608

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.8304 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 45.9065 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.0040	26.8419	26.6830	25.9368	25.7972	25.1472	25.1472	25.0269	25.3976	25.7972	26.0796	26.3749	(38)
Heat transfer coeff	72.9105	72.7484	72.5895	71.8433	71.7037	71.0538	71.0538	70.9334	71.3041	71.7037	71.9861	72.2814	(39)

Average = Sum(39)m / 12 = 71.8427

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3437	1.3407	1.3378	1.3241	1.3215	1.3095	1.3095	1.3073	1.3141	1.3215	1.3267	1.3321	(40)
HLP (average)												1.3240	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8156 (42)

Hot water usage for mixer showers

54.6619	53.8405	52.6434	50.3531	48.6629	46.7781	45.7067	46.8947	48.1969	50.2207	52.5602	54.4525	(42a)

Hot water usage for baths

23.6296	23.2787	22.7845	21.8733	21.1910	20.4345	20.0258	20.5166	21.0509	21.8604	22.7904	23.5498	(42b)

Hot water usage for other uses

33.2240	32.0159	30.8077	29.5996	28.3914	27.1833	27.1833	28.3914	29.5996	30.8077	32.0159	33.2240	(42c)

Average daily hot water use (litres/day) 102.5085 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5156	109.1351	106.2357	101.8260	98.2454	94.3958	92.9158	95.8027	98.8474	102.8888	107.3665	111.2263	(44)
Energy conte	176.6135	155.4069	163.2803	139.3948	132.2572	116.0707	112.3736	118.6237	121.8887	139.6192	152.9632	174.1535	(45)
Energy content (annual)										Total = Sum(45)m =		1702.6452	
Distribution loss (46)m = 0.15 x (45)m	26.4920	23.3110	24.4920	20.9092	19.8386	17.4106	16.8560	17.7936	18.2833	20.9429	22.9445	26.1230	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	223.2084	197.4926	209.8752	184.4866	178.8521	161.1625	158.9685	165.2186	166.9805	186.2141	198.0550	220.7484	(62)
WWHRS	-24.9892	-22.1006	-23.1425	-19.1629	-17.8591	-15.2822	-14.3246	-15.2328	-15.8115	-18.6401	-21.1169	-24.5264	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	198.2192	175.3920	186.7327	165.3237	160.9930	145.8804	144.6439	149.9858	151.1690	167.5740	176.9381	196.2220	(64)
										Total per year (kWh/year) = Sum(64)m =		2019.0739	(64)
12Total per year (kWh/year)												2019	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	95.9999	85.3414	91.5666	82.4222	81.2514	74.6670	74.6402	76.7183	76.6015	83.6993	86.9337	95.1820	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	90.7823	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.0022	88.5739	80.0022	82.6689	80.0022	82.6689	80.0022	80.0022	82.6689	80.0022	82.6689	80.0022	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.2765	159.9189	155.7801	146.9690	135.8466	125.3931	118.4095	116.7671	120.9059	129.7170	140.8394	151.2929	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	32.0782	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	(71)
Water heating gains (Table 5)	129.0321	126.9961	123.0734	114.4753	109.2089	103.7041	100.3228	103.1160	106.3909	112.4991	120.7413	127.9327	(72)

Total internal gains

	420.5455	428.7236	412.0904	397.3480	378.2924	362.0009	348.9692	350.1200	360.2005	375.4530	397.4844	412.4626 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.9100	36.7938	0.6300	0.7000	0.7700	55.2113	(77)
West	6.5900	19.6403	0.6300	0.7000	0.7700	39.5553	(80)

Solar gains	94.7666	171.4239	256.1084	345.2881	406.3502	410.4519	392.9061	347.3203	287.5379	195.7563	115.4513	79.7778	(83)
Total gains	515.3122	600.1474	668.1988	742.6361	784.6427	772.4528	741.8753	697.4403	647.7384	571.2093	512.9356	492.2403	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.6452	52.7625	52.8779	53.4272	53.5312	54.0209	54.0209	54.1125	53.8312	53.5312	53.3212	53.1034	
alpha	4.5097	4.5175	4.5252	4.5618	4.5687	4.6014	4.6014	4.6075	4.5887	4.5687	4.5547	4.5402	
util living area	0.9880	0.9756	0.9492	0.8783	0.7480	0.5664	0.4168	0.4602	0.6937	0.9105	0.9762	0.9901	(86)
MIT	19.6670	19.8974	20.2121	20.5902	20.8491	20.9674	20.9935	20.9899	20.9193	20.5738	20.0567	19.6295	(87)
Th 2	19.8067	19.8091	19.8113	19.8220	19.8240	19.8334	19.8334	19.8351	19.8298	19.8240	19.8200	19.8158	(88)
util rest of house	0.9841	0.9680	0.9332	0.8420	0.6818	0.4726	0.3087	0.3476	0.6003	0.8749	0.9673	0.9868	(89)
MIT 2	18.3014	18.5924	18.9831	19.4360	19.7088	19.8169	19.8316	19.8321	19.7820	19.4323	18.8042	18.2603	(90)
Living area fraction										fLA = Living area / (4) =		0.4711	(91)
MIT	18.9447	19.2071	19.5620	19.9797	20.2460	20.3589	20.3790	20.3775	20.3177	19.9700	19.3942	18.9053	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9447	19.2071	19.5620	19.9797	20.2460	20.3589	20.3790	20.3775	20.3177	19.9700	19.3942	18.9053	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9630	0.9292	0.8474	0.7070	0.5159	0.3598	0.4008	0.6414	0.8800	0.9632	0.9835	(94)
Useful gains	505.1511	577.9594	620.8570	629.3404	554.7535	398.5463	266.9088	279.5255	415.4341	502.6901	494.0427	484.1061	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1067.7516	1040.8198	948.1671	796.0013	612.7773	409.1895	268.5097	282.1382	443.3502	671.8659	885.0118	1062.9187	(97)
Space heating kWh	418.5748	311.0422	243.5187	119.9958	43.1697	0.0000	0.0000	0.0000	0.0000	125.8667	281.4978	430.6365	(98a)
Space heating requirement - total per year (kWh/year)												1974.3022	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	418.5748	311.0422	243.5187	119.9958	43.1697	0.0000	0.0000	0.0000	0.0000	125.8667	281.4978	430.6365	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1974.3022	
Space heating per m2											(98c) / (4) =	36.3860	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	418.5748	311.0422	243.5187	119.9958	43.1697	0.0000	0.0000	0.0000	0.0000	125.8667	281.4978	430.6365	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	453.4938	336.9905	263.8339	130.0063	46.7711	0.0000	0.0000	0.0000	0.0000	136.3670	304.9813	466.5618	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	198.2192	175.3920	186.7327	165.3237	160.9930	145.8804	144.6439	149.9858	151.1690	167.5740	176.9381	196.2220	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6940	85.3300	84.6562	83.3529	81.5476	79.8000	79.8000	79.8000	79.8000	83.4268	85.0958	85.7719	(217)
Fuel for water heating, kWh/month	231.3104	205.5455	220.5777	198.3419	197.4221	182.8075	181.2581	187.9522	189.4348	200.8635	207.9281	228.7718	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.6229	13.3355	12.0071	8.7969	6.7950	5.5516	6.1986	8.0572	10.4655	13.7313	15.5095	17.0849	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.6610	-21.7884	-33.0014	-39.1768	-44.0882	-41.8486	-41.3564	-38.1321	-32.7591	-25.8294	-16.5166	-12.5494	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.2008	-11.1887	-22.7018	-34.7800	-46.6528	-47.1016	-46.5297	-39.0769	-28.2371	-16.2041	-7.0100	-4.0932	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2139.0057	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2432.2133	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	134.1561	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-670.4841	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4120.8911	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2139.0057	0.2100	449.1912	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2432.2133	0.2100	510.7648	(264)
Space and water heating			959.9560	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	134.1561	0.1443	19.3629	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-361.7074	0.1335	-48.2792	
PV Unit electricity exported	-308.7767	0.1253	-38.6985	
Total			-86.9777	(269)
Total CO2, kg/year			904.2704	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.6700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2139.0057	1.1300	2417.0764	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2432.2133	1.1300	2748.4011	(278)
Space and water heating			5165.4775	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	134.1561	1.5338	205.7732	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-361.7074	1.4932	-540.1162	
PV Unit electricity exported	-308.7767	0.4600	-142.0421	
Total			-682.1583	(283)
Total Primary energy kWh/year			4819.1932	(286)
Target Primary Energy Rate (TPER)			88.8200	(287)

Full SAP Calculation Printout

Plot Reference	P-49	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-49
Plot Address	Flat 17, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	77 C	**DER**	6.90	**TER**	16.67
Environmental	95 A	**% DER < TER**			58.61
CO_2 Emissions (t/year)	0.31	**DFEE**	38.19	**TFEE**	45.35
Compliance Check	See BREL	**% DFEE < TFEE**			15.78
% DPER < TPER	19.99	**DPER**	71.06	**TPER**	88.82

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.2600	(1b)	x 2.5500	(2b) =	138.3630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.2600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	138.3630	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8300 (17)
Infiltration rate		0.1415 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1203 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1534	0.1503	0.1473	0.1323	0.1293	0.1143	0.1143	0.1113	0.1203	0.1293	0.1353	0.1413	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.2700	1.1450	8.3244			(27)
Brickwork	45.4000	12.6900	32.7100	0.2100	6.8691	110.0000	3598.1002	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2100	0.9072	110.0000	475.2000	(29a)
ColdRoof	54.2600		54.2600	0.0900	4.8834	9.0000	488.3400	(30)
Total net area of external elements Aum(A, m2)			106.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6622			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			54.2600			70.0000	3798.2000	(32d)
Internal Wall 1			119.5500			9.0000	1075.9500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13818.1902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		254.6662 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425	
E16 Corner (normal)	5.7000	0.0540	0.3078	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765	
E18 Party wall between dwellings	8.5500	0.0380	0.3249	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.3700	0.0500	0.4185	
E4 Jamb	20.2900	0.0160	0.3246	
E15 Flat roof with parapet	22.1700	0.3000	6.6510	
P4 Party wall - Roof (insulation at ceiling level)	13.8400	0.1010	1.3978	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.9907	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	39.6529	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	(38)
Heat transfer coeff	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	(39)
Average = Sum(39)m / 12 =												62.4828	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	(40)
HLP (average)												1.1515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											1.8156	(42)
Hot water usage for mixer showers												
54.6619	53.8405	52.6434	50.3531	48.6629	46.7781	45.7067	46.8947	48.1969	50.2207	52.5602	54.4525	(42a)
Hot water usage for baths												
23.6296	23.2787	22.7845	21.8733	21.1910	20.4345	20.0258	20.5166	21.0509	21.8604	22.7904	23.5498	(42b)
Hot water usage for other uses												
33.2240	32.0159	30.8077	29.5996	28.3914	27.1833	27.1833	28.3914	29.5996	30.8077	32.0159	33.2240	(42c)
Average daily hot water use (litres/day)											102.5085	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	111.5156	109.1351	106.2357	101.8260	98.2454	94.3958	92.9158	95.8027	98.8474	102.8888	107.3665	111.2263	(44)
Energy conte	176.6135	155.4069	163.2803	139.3948	132.2572	116.0707	112.3736	118.6237	121.8887	139.6192	152.9632	174.1535	(45)
Energy content (annual)										Total = Sum(45)m =		1702.6452	
Distribution loss (46)m = 0.15 x (45)m													
	26.4920	23.3110	24.4920	20.9092	19.8386	17.4106	16.8560	17.7936	18.2833	20.9429	22.9445	26.1230	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(64)
										Total per year (kWh/year) = Sum(64)m =		2019.9762	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	58.7240	51.6728	54.2907	46.3488	43.9755	38.5935	37.3642	39.4424	40.5280	46.4234	50.8603	57.9060	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.8384	16.7321	13.6075	10.3017	7.7007	6.5012	7.0248	9.1311	12.2557	15.5615	18.1625	19.3620	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	236.2336	238.6850	232.5076	219.3567	202.7561	187.1539	176.7306	174.2793	180.4566	193.6075	210.2081	225.8104	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	(71)
Water heating gains (Table 5)													
	78.9301	76.8940	72.9714	64.3733	59.1069	53.6021	50.2207	53.0140	56.2889	62.3970	70.6393	77.8307	(72)
Total internal gains													
	418.0245	416.3335	403.1089	378.0542	353.5861	331.2796	317.9986	320.4468	333.0237	355.5884	383.0323	407.0255	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)
West	7.2700	19.6403	0.3300	0.0000	0.7700	36.2816	(80)

Solar gains	86.9549	157.2898	234.9853	316.8018	372.8211	376.5826	360.4853	318.6642	263.8197	179.6141	105.9338	73.2020	(83)
Total gains	504.9794	573.6234	638.0942	694.8559	726.4072	707.8622	678.4839	639.1110	596.8434	535.2025	488.9661	480.2274	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	
alpha	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	
util living area	0.9871	0.9746	0.9438	0.8691	0.7309	0.5511	0.4028	0.4455	0.6780	0.9054	0.9759	0.9898	(86)
MIT	19.9392	20.1302	20.4088	20.7039	20.9024	20.9810	20.9968	20.9947	20.9485	20.6784	20.2383	19.8821	(87)
Th 2	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	(88)
util rest of house	0.9831	0.9670	0.9274	0.8336	0.6693	0.4675	0.3088	0.3469	0.5927	0.8706	0.9673	0.9866	(89)
MIT 2	18.7552	18.9944	19.3366	19.6798	19.8843	19.9491	19.9580	19.9573	19.9281	19.6622	19.1335	18.6831	(90)
Living area fraction										fLA = Living area / (4) =		0.4711	(91)
MIT	19.3129	19.5294	19.8417	20.1622	20.3639	20.4352	20.4474	20.4460	20.4088	20.1409	19.6539	19.2479	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3129	19.5294	19.8417	20.1622	20.3639	20.4352	20.4474	20.4460	20.4088	20.1409	19.6539	19.2479	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9799	0.9632	0.9253	0.8412	0.6943	0.5064	0.3532	0.3934	0.6310	0.8775	0.9641	0.9838	(94)
Useful gains	494.8107	552.5010	590.4067	584.4986	504.3599	358.4757	239.6077	251.4452	376.6207	469.6446	471.4119	472.4384	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	938.0502	914.0862	833.6258	703.6952	541.3449	364.5995	240.3941	252.8044	394.1895	596.1412	784.4053	940.2342	(97)
Space heating kWh	329.7702	242.9853	180.9550	85.8216	27.5168	0.0000	0.0000	0.0000	0.0000	94.1135	225.3553	348.0401	(98a)
Space heating requirement - total per year (kWh/year)												1534.5577	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	329.7702	242.9853	180.9550	85.8216	27.5168	0.0000	0.0000	0.0000	94.1135	225.3553	348.0401	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1534.5577	
Space heating per m2										(98c) / (4) =		28.2816	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Fraction of main heating from main system 2 0.0000 (203)
Fraction of total heating from main system 1 1.0000 (204)
Fraction of total heating from main system 2 0.0000 (205)
Efficiency of main space heating system 1 (in %) 100.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	329.7702	242.9853	180.9550	85.8216	27.5168	0.0000	0.0000	0.0000	0.0000	94.1135	225.3553	348.0401	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	329.7702	242.9853	180.9550	85.8216	27.5168	0.0000	0.0000	0.0000	0.0000	94.1135	225.3553	348.0401	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	62.7280	55.3895	58.6194	50.9912	49.0597	43.8040	42.9327	44.8586	45.5968	51.3283	55.1723	61.9699	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.9820	2.6934	2.9820	2.8858	2.9820	2.8858	2.9820	2.9820	2.8858	2.9820	2.8858	2.9820	(231)
Lighting	16.4891	13.2282	11.9105	8.7262	6.7403	5.5069	6.1488	7.9924	10.3813	13.6209	15.3847	16.9474	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1534.5577 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 622.4505 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.1110	(230a)
Total electricity for the above, kWh/year	35.1110	(231)
Electricity for lighting (calculated in Appendix L)	133.0769	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2325.1960	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1534.5577	16.4900	253.0486	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	622.4505	16.4900	102.6421	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	35.1110	16.4900	5.7898	(249)
Energy for lighting	133.0769	16.4900	21.9444	(250)
Additional standing charges			0.0000	(251)
Total energy cost			383.4248	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3906	(257)
SAP value		77.4581	
SAP rating (Section 12)		77	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1534.5577	0.1563	239.7796	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	622.4505	0.1411	87.8451	(264)
Space and water heating			327.6247	(265)
Pumps, fans and electric keep-hot	35.1110	0.1387	4.8703	(267)
Energy for lighting	133.0769	0.1443	19.2071	(268)
Total CO2, kg/year			351.7022	(272)
CO2 emissions per m2			6.4800	(273)
EI value			95.2521	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.2600 (1b)	x	2.5500 (2b)	=	138.3630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 54.2600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.3630	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8300	(17)
Infiltration rate		0.1415	(18)
Number of sides sheltered		2	(19)

Shelter factor									(20) = 1 - [0.075 x (19)] =			0.8500	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1203	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1293	0.1233	0.1233	0.1143	0.1173	0.1022	0.1022	0.0992	0.1022	0.1143	0.1113	0.1203	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.2700	1.1450	8.3244			(27)
Brickwork	45.4000	12.6900	32.7100	0.2100	6.8691	110.0000	3598.1002	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2100	0.9072	110.0000	475.2000	(29a)
ColdRoof	54.2600		54.2600	0.0900	4.8834	9.0000	488.3400	(30)
Total net area of external elements Aum(A, m2)			106.0400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.6622			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			54.2600			70.0000	3798.2000	(32d)
Internal Wall 1			119.5500			9.0000	1075.9500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13818.1902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		254.6662 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425
E16 Corner (normal)	5.7000	0.0540	0.3078
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	8.5500	0.0380	0.3249
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.3700	0.0500	0.4185
E4 Jamb	20.2900	0.0160	0.3246
E15 Flat roof with parapet	22.1700	0.3000	6.6510
P4 Party wall - Roof (insulation at ceiling level)	13.8400	0.1010	1.3978

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.9907 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.6529 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	(38)
Heat transfer coeff	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	(39)
Average = Sum(39)m / 12 =												62.4828	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	(40)
HLP (average)												1.1515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8156	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
54.6619	53.8405	52.6434	50.3531	48.6629	46.7781	45.7067	46.8947	48.1969	50.2207	52.5602	54.4525	(42a)

Hot water usage for baths

23.6296	23.2787	22.7845	21.8733	21.1910	20.4345	20.0258	20.5166	21.0509	21.8604	22.7904	23.5498	(42b)

Hot water usage for other uses

33.2240	32.0159	30.8077	29.5996	28.3914	27.1833	27.1833	28.3914	29.5996	30.8077	32.0159	33.2240	(42c)

Average daily hot water use (litres/day)	102.5085	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5156	109.1351	106.2357	101.8260	98.2454	94.3958	92.9158	95.8027	98.8474	102.8888	107.3665	111.2263	(44)
Energy conte	176.6135	155.4069	163.2803	139.3948	132.2572	116.0707	112.3736	118.6237	121.8887	139.6192	152.9632	174.1535	(45)
Energy content (annual)										Total = Sum(45)m =		1702.6452	
Distribution loss (46)m = 0.15 x (45)m	26.4920	23.3110	24.4920	20.9092	19.8386	17.4106	16.8560	17.7936	18.2833	20.9429	22.9445	26.1230	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(64)

Total per year (kWh/year) = Sum(64)m =	2019.9762	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

	58.7240	51.6728	54.2907	46.3488	43.9755	38.5935	37.3642	39.4424	40.5280	46.4234	50.8603	57.9060 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.8384	16.7321	13.6075	10.3017	7.7007	6.5012	7.0248	9.1311	12.2557	15.5615	18.1625	19.3620	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	236.2336	238.6850	232.5076	219.3567	202.7561	187.1539	176.7306	174.2793	180.4566	193.6075	210.2081	225.8104	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	(71)

Water heating gains (Table 5)

	78.9301	76.8940	72.9714	64.3733	59.1069	53.6021	50.2207	53.0140	56.2889	62.3970	70.6393	77.8307	(72)

Total internal gains

	418.0245	416.3335	403.1089	378.0542	353.5861	331.2796	317.9986	320.4468	333.0237	355.5884	383.0323	407.0255	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(77)
West	7.2700	23.8018	0.3300	0.0000	0.7700	43.9692	(80)

Solar gains	103.2714	163.3679	242.6846	332.9596	382.5569	409.1455	387.6290	350.7163	290.7061	200.3343	123.9642	87.4239	(83)
Total gains	521.2959	579.7014	645.7935	711.0138	736.1430	740.4252	705.6276	671.1630	623.7298	555.9228	506.9965	494.4494	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	
alpha	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	
util living area													
	0.9819	0.9677	0.9270	0.8254	0.6521	0.4351	0.2918	0.3159	0.5823	0.8621	0.9639	0.9854	(86)
MIT	20.0626	20.2312	20.5113	20.7923	20.9492	20.9946	20.9995	20.9992	20.9772	20.7774	20.3702	20.0147	(87)
Th 2	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	(88)
util rest of house													
	0.9761	0.9578	0.9056	0.7804	0.5807	0.3499	0.2000	0.2195	0.4896	0.8141	0.9508	0.9807	(89)
MIT 2	18.9111	19.1206	19.4598	19.7751	19.9250	19.9569	19.9589	19.9588	19.9478	19.7693	19.2967	18.8513	(90)
Living area fraction										fLA = Living area / (4) =		0.4711	(91)
MIT	19.4535	19.6437	19.9551	20.2543	20.4075	20.4458	20.4491	20.4489	20.4327	20.2442	19.8024	19.3993	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4535	19.6437	19.9551	20.2543	20.4075	20.4458	20.4491	20.4489	20.4327	20.2442	19.8024	19.3993	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9726	0.9542	0.9055	0.7941	0.6124	0.3900	0.2433	0.2650	0.5328	0.8286	0.9484	0.9775	(94)
Useful gains	507.0205	553.1517	584.7871	564.6240	450.7868	288.7799	171.6721	177.8567	332.3064	460.6410	480.8528	483.3142	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	896.8468	871.2439	784.4780	646.9649	469.0874	290.2796	171.7692	178.0080	339.4514	546.3618	737.4471	893.4625	(97)
Space heating kWh													
	290.0307	213.7580	148.5700	59.2855	13.6156	0.0000	0.0000	0.0000	0.0000	63.7763	184.7479	305.1504	(98a)
Space heating requirement - total per year (kWh/year)												1278.9343	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	290.0307	213.7580	148.5700	59.2855	13.6156	0.0000	0.0000	0.0000	0.0000	63.7763	184.7479	305.1504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1278.9343	
Space heating per m2											(98c) / (4) =	23.5705	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	290.0307	213.7580	148.5700	59.2855	13.6156	0.0000	0.0000	0.0000	0.0000	63.7763	184.7479	305.1504	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	290.0307	213.7580	148.5700	59.2855	13.6156	0.0000	0.0000	0.0000	0.0000	63.7763	184.7479	305.1504	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (215)
Space heating fuel used, main system 2 0.0000 (213)

Water heating
Water heating requirement
203.5649 179.7501 190.2317 165.4768 159.2086 142.1527 139.3250 145.5751 147.9707 166.5706 179.0452 201.1049 (64)
Efficiency of water heater 324.5200 (216)
(217)m 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 324.5200 (217)
Fuel for water heating, kWh/month
62.7280 55.3895 58.6194 50.9912 49.0597 43.8040 42.9327 44.8586 45.5968 51.3283 55.1723 61.9699 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 2.9820 2.6934 2.9820 2.8858 2.9820 2.8858 2.9820 2.9820 2.8858 2.9820 2.8858 2.9820 (231)
Lighting 16.4891 13.2282 11.9105 8.7262 6.7403 5.5069 6.1488 7.9924 10.3813 13.6209 15.3847 16.9474 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 1278.9343 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 622.4505 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 35.1110 (230a)
Total electricity for the above, kWh/year 35.1110 (231)
Electricity for lighting (calculated in Appendix L) 133.0769 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2069.5727 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1278.9343	27.6700	353.8811	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	622.4505	27.6700	172.2320	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	35.1110	27.6700	9.7152	(249)
Energy for lighting	133.0769	27.6700	36.8224	(250)
Additional standing charges			0.0000	(251)
Total energy cost			572.6508	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1278.9343	0.1570	200.7926	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	622.4505	0.1411	87.8451	(264)
Space and water heating			288.6377	(265)
Pumps, fans and electric keep-hot	35.1110	0.1387	4.8703	(267)
Energy for lighting	133.0769	0.1443	19.2071	(268)
Total CO2, kg/year			312.7152	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1278.9343	1.5812	2022.2746	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	622.4505	1.5219	947.2769	(278)
Space and water heating			2969.5515	(279)
Pumps, fans and electric keep-hot	35.1110	1.5128	53.1159	(281)
Energy for lighting	133.0769	1.5338	204.1177	(282)
Total Primary energy kWh/year			3226.7852	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 77
Current environmental impact rating: A 95

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 77
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£573	£573	£0
Space heating	£364	£364	£0
Water heating	£172	£172	£0
Lighting	£37	£37	£0
Total cost of fuels	£573	£573	£0
Total cost of uses	£573	£573	£0
Delivered energy	38 kWh/m²	38 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	59 kWh/m²	59 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	54.2600 (1b)	x	2.5500 (2b)	=	138.3630 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.2600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.3630	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8300 (17)
Infiltration rate		0.1415 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1203 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1534	0.1503	0.1473	0.1323	0.1293	0.1143	0.1143	0.1113	0.1203	0.1293	0.1353	0.1413	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.2700	1.1450	8.3244			(27)
Brickwork	45.4000	12.6900	32.7100	0.2100	6.8691	110.0000	3598.1002	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2100	0.9072	110.0000	475.2000	(29a)
ColdRoof	54.2600		54.2600	0.0900	4.8834	9.0000	488.3400	(30)
Total net area of external elements Aum(A, m2)			106.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6622			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			54.2600			70.0000	3798.2000	(32d)
Internal Wall 1			119.5500			9.0000	1075.9500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13818.1902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		254.6662 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425
E16 Corner (normal)	5.7000	0.0540	0.3078
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	8.5500	0.0380	0.3249
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.3700	0.0500	0.4185
E4 Jamb	20.2900	0.0160	0.3246
E15 Flat roof with parapet	22.1700	0.3000	6.6510
P4 Party wall - Roof (insulation at ceiling level)	13.8400	0.1010	1.3978

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.9907 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.6529 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	(38)
Heat transfer coeff	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	(39)
Average = Sum(39)m / 12 =												62.4828	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	(40)
HLP (average)												1.1515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.8156 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
54.6619	53.8405	52.6434	50.3531	48.6629	46.7781	45.7067	46.8947	48.1969	50.2207	52.5602	54.4525	(42a)

Hot water usage for baths

23.6296	23.2787	22.7845	21.8733	21.1910	20.4345	20.0258	20.5166	21.0509	21.8604	22.7904	23.5498	(42b)

Hot water usage for other uses

33.2240	32.0159	30.8077	29.5996	28.3914	27.1833	27.1833	28.3914	29.5996	30.8077	32.0159	33.2240	(42c)

Average daily hot water use (litres/day)		102.5085 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5156	109.1351	106.2357	101.8260	98.2454	94.3958	92.9158	95.8027	98.8474	102.8888	107.3665	111.2263	(44)
Energy conte	176.6135	155.4069	163.2803	139.3948	132.2572	116.0707	112.3736	118.6237	121.8887	139.6192	152.9632	174.1535	(45)
Energy content (annual)										Total = Sum(45)m =		1702.6452	

Distribution loss (46)m = 0.15 x (45)m

26.4920	23.3110	24.4920	20.9092	19.8386	17.4106	16.8560	17.7936	18.2833	20.9429	22.9445	26.1230	(46)

Water storage loss (or HIU loss):

Store volume		200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.6100 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(64)
								Total per year (kWh/year) = Sum(64)m =			2019.9762	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)

Heat gains from water heating, kWh/month

58.7240	51.6728	54.2907	46.3488	43.9755	38.5935	37.3642	39.4424	40.5280	46.4234	50.8603	57.9060	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8384	16.7321	13.6075	10.3017	7.7007	6.5012	7.0248	9.1311	12.2557	15.5615	18.1625	19.3620	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.2336	238.6850	232.5076	219.3567	202.7561	187.1539	176.7306	174.2793	180.4566	193.6075	210.2081	225.8104	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	(71)
Water heating gains (Table 5)	78.9301	76.8940	72.9714	64.3733	59.1069	53.6021	50.2207	53.0140	56.2889	62.3970	70.6393	77.8307	(72)

Total internal gains

	418.0245	416.3335	403.1089	378.0542	353.5861	331.2796	317.9986	320.4468	333.0237	355.5884	383.0323	407.0255 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4200	36.7938	0.3300	0.0000	0.7700	50.6733	(77)
West	7.2700	19.6403	0.3300	0.0000	0.7700	36.2816	(80)

Solar gains	86.9549	157.2898	234.9853	316.8018	372.8211	376.5826	360.4853	318.6642	263.8197	179.6141	105.9338	73.2020 (83)
Total gains	504.9794	573.6234	638.0942	694.8559	726.4072	707.8622	678.4839	639.1110	596.8434	535.2025	488.9661	480.2274 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	
alpha	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	
util living area	0.9871	0.9746	0.9438	0.8691	0.7309	0.5511	0.4028	0.4455	0.6780	0.9054	0.9759	0.9898	(86)
MIT	19.9392	20.1302	20.4088	20.7039	20.9024	20.9810	20.9968	20.9947	20.9485	20.6784	20.2383	19.8821	(87)
Th 2	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	(88)
util rest of house	0.9831	0.9670	0.9274	0.8336	0.6693	0.4675	0.3088	0.3469	0.5927	0.8706	0.9673	0.9866	(89)
MIT 2	18.7552	18.9944	19.3366	19.6798	19.8843	19.9491	19.9580	19.9573	19.9281	19.6622	19.1335	18.6831	(90)
Living area fraction									fLA = Living area / (4) =			0.4711	(91)
MIT	19.3129	19.5294	19.8417	20.1622	20.3639	20.4352	20.4474	20.4460	20.4088	20.1409	19.6539	19.2479	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3129	19.5294	19.8417	20.1622	20.3639	20.4352	20.4474	20.4460	20.4088	20.1409	19.6539	19.2479	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9799	0.9632	0.9253	0.8412	0.6943	0.5064	0.3532	0.3934	0.6310	0.8775	0.9641	0.9838	(94)
Useful gains	494.8107	552.5010	590.4067	584.4986	504.3599	358.4757	239.6077	251.4452	376.6207	469.6446	471.4119	472.4384	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	938.0502	914.0862	833.6258	703.6952	541.3449	364.5995	240.3941	252.8044	394.1895	596.1412	784.4053	940.2342	(97)
Space heating kWh	329.7702	242.9853	180.9550	85.8216	27.5168	0.0000	0.0000	0.0000	0.0000	94.1135	225.3553	348.0401	(98a)
Space heating requirement - total per year (kWh/year)												1534.5577	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	329.7702	242.9853	180.9550	85.8216	27.5168	0.0000	0.0000	0.0000	0.0000	94.1135	225.3553	348.0401	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1534.5577	
Space heating per m2											(98c) / (4) =	28.2816	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	329.7702	242.9853	180.9550	85.8216	27.5168	0.0000	0.0000	0.0000	0.0000	94.1135	225.3553	348.0401	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	329.7702	242.9853	180.9550	85.8216	27.5168	0.0000	0.0000	0.0000	0.0000	94.1135	225.3553	348.0401	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	62.7280	55.3895	58.6194	50.9912	49.0597	43.8040	42.9327	44.8586	45.5968	51.3283	55.1723	61.9699	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.9820	2.6934	2.9820	2.8858	2.9820	2.8858	2.9820	2.9820	2.8858	2.9820	2.8858	2.9820	(231)
Lighting	16.4891	13.2282	11.9105	8.7262	6.7403	5.5069	6.1488	7.9924	10.3813	13.6209	15.3847	16.9474	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1534.5577	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	622.4505	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	35.1110	(230a)
Total electricity for the above, kWh/year	35.1110	(231)
Electricity for lighting (calculated in Appendix L)	133.0769	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2325.1960	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1534.5577	16.4900	253.0486	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	622.4505	16.4900	102.6421	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	35.1110	16.4900	5.7898	(249)
Energy for lighting	133.0769	16.4900	21.9444	(250)
Additional standing charges			0.0000	(251)
Total energy cost			383.4248	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3906	(257)
SAP value		77.4581	
SAP rating (Section 12)		77	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1534.5577	0.1563	239.7796	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	622.4505	0.1411	87.8451	(264)
Space and water heating			327.6247	(265)
Pumps, fans and electric keep-hot	35.1110	0.1387	4.8703	(267)
Energy for lighting	133.0769	0.1443	19.2071	(268)
Total CO2, kg/year			351.7022	(272)
CO2 emissions per m2			6.4800	(273)
EI value			95.2521	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		54.2600	(1b)	x 2.5500	(2b) =	138.3630	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.2600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		138.3630	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8300	(17)
Infiltration rate		0.1415	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1203	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1293	0.1233	0.1233	0.1143	0.1173	0.1022	0.1022	0.0992	0.1022	0.1143	0.1113	0.1203	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.2700	1.1450	8.3244			(27)
Brickwork	45.4000	12.6900	32.7100	0.2100	6.8691	110.0000	3598.1002	(29a)
Communal Wall	6.3800	2.0600	4.3200	0.2100	0.9072	110.0000	475.2000	(29a)
ColdRoof	54.2600		54.2600	0.0900	4.8834	9.0000	488.3400	(30)
Total net area of external elements Aum(A, m2)			106.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6622			(33)
Main dwelling								
Party Wall 1			39.8400	0.0000	0.0000	110.0000	4382.4000	(32)
Party Floor 1			54.2600			70.0000	3798.2000	(32d)
Internal Wall 1			119.5500			9.0000	1075.9500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13818.1902 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		254.6662 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	22.1700	0.0380	0.8425
E16 Corner (normal)	5.7000	0.0540	0.3078
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0970	-0.2765
E18 Party wall between dwellings	8.5500	0.0380	0.3249
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.8400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.3700	0.0500	0.4185
E4 Jamb	20.2900	0.0160	0.3246
E15 Flat roof with parapet	22.1700	0.3000	6.6510
P4 Party wall - Roof (insulation at ceiling level)	13.8400	0.1010	1.3978

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.9907 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.6529 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	22.8299	(38)
Heat transfer coeff	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	62.4828	(39)
Average = Sum(39)m / 12 =												62.4828	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	1.1515	(40)
HLP (average)												1.1515	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8156	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
54.6619	53.8405	52.6434	50.3531	48.6629	46.7781	45.7067	46.8947	48.1969	50.2207	52.5602	54.4525	(42a)

Hot water usage for baths

23.6296	23.2787	22.7845	21.8733	21.1910	20.4345	20.0258	20.5166	21.0509	21.8604	22.7904	23.5498	(42b)

Hot water usage for other uses

33.2240	32.0159	30.8077	29.5996	28.3914	27.1833	27.1833	28.3914	29.5996	30.8077	32.0159	33.2240	(42c)

Average daily hot water use (litres/day)	102.5085	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5156	109.1351	106.2357	101.8260	98.2454	94.3958	92.9158	95.8027	98.8474	102.8888	107.3665	111.2263	(44)
Energy conte	176.6135	155.4069	163.2803	139.3948	132.2572	116.0707	112.3736	118.6237	121.8887	139.6192	152.9632	174.1535	(45)
Energy content (annual)										Total = Sum(45)m =		1702.6452	
Distribution loss (46)m = 0.15 x (45)m	26.4920	23.3110	24.4920	20.9092	19.8386	17.4106	16.8560	17.7936	18.2833	20.9429	22.9445	26.1230	(46)

Water storage loss (or HIU loss):		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8694	(55)

Total storage loss

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)

If cylinder contains dedicated solar storage

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049 (64)

Total per year (kWh/year) = Sum(64)m = 2019.9762 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	58.7240	51.6728	54.2907	46.3488	43.9755	38.5935	37.3642	39.4424	40.5280	46.4234	50.8603	57.9060 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	108.9387	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.8384	16.7321	13.6075	10.3017	7.7007	6.5012	7.0248	9.1311	12.2557	15.5615	18.1625	19.3620	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	236.2336	238.6850	232.5076	219.3567	202.7561	187.1539	176.7306	174.2793	180.4566	193.6075	210.2081	225.8104	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	47.7095	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	-72.6258	(71)

Water heating gains (Table 5)

	78.9301	76.8940	72.9714	64.3733	59.1069	53.6021	50.2207	53.0140	56.2889	62.3970	70.6393	77.8307	(72)

Total internal gains

	418.0245	416.3335	403.1089	378.0542	353.5861	331.2796	317.9986	320.4468	333.0237	355.5884	383.0323	407.0255	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.4200	43.0593	0.3300	0.0000	0.7700	59.3022	(77)
West	7.2700	23.8018	0.3300	0.0000	0.7700	43.9692	(80)

Solar gains	103.2714	163.3679	242.6846	332.9596	382.5569	409.1455	387.6290	350.7163	290.7061	200.3343	123.9642	87.4239	(83)
Total gains	521.2959	579.7014	645.7935	711.0138	736.1430	740.4252	705.6276	671.1630	623.7298	555.9228	506.9965	494.4494	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	61.4311	
alpha	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	5.0954	
util living area	0.9819	0.9677	0.9270	0.8254	0.6521	0.4351	0.2918	0.3159	0.5823	0.8621	0.9639	0.9854	(86)
MIT	20.0626	20.2312	20.5113	20.7923	20.9492	20.9946	20.9995	20.9992	20.9772	20.7774	20.3702	20.0147	(87)
Th 2	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	19.9590	(88)
util rest of house	0.9761	0.9578	0.9056	0.7804	0.5807	0.3499	0.2000	0.2195	0.4896	0.8141	0.9508	0.9807	(89)
MIT 2	18.9111	19.1206	19.4598	19.7751	19.9250	19.9569	19.9589	19.9588	19.9478	19.7693	19.2967	18.8513	(90)
Living area fraction										fLA = Living area / (4) =		0.4711	(91)
MIT	19.4535	19.6437	19.9551	20.2543	20.4075	20.4458	20.4491	20.4489	20.4327	20.2442	19.8024	19.3993	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4535	19.6437	19.9551	20.2543	20.4075	20.4458	20.4491	20.4489	20.4327	20.2442	19.8024	19.3993	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9726	0.9542	0.9055	0.7941	0.6124	0.3900	0.2433	0.2650	0.5328	0.8286	0.9484	0.9775	(94)
Useful gains	507.0205	553.1517	584.7871	564.6240	450.7868	288.7799	171.6721	177.8567	332.3064	460.6410	480.8528	483.3142	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	896.8468	871.2439	784.4780	646.9649	469.0874	290.2796	171.7692	178.0080	339.4514	546.3618	737.4471	893.4625	(97)
Space heating kWh	290.0307	213.7580	148.5700	59.2855	13.6156	0.0000	0.0000	0.0000	0.0000	63.7763	184.7479	305.1504	(98a)

Space heating requirement - total per year (kWh/year) 1278.9343

Solar heating kWh

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	290.0307	213.7580	148.5700	59.2855	13.6156	0.0000	0.0000	0.0000	0.0000	63.7763	184.7479	305.1504	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1278.9343

Space heating per m2 (98c) / (4) = 23.5705 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s)	1.0000 (202)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	290.0307	213.7580	148.5700	59.2855	13.6156	0.0000	0.0000	0.0000	0.0000	63.7763	184.7479	305.1504	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	290.0307	213.7580	148.5700	59.2855	13.6156	0.0000	0.0000	0.0000	0.0000	63.7763	184.7479	305.1504	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	203.5649	179.7501	190.2317	165.4768	159.2086	142.1527	139.3250	145.5751	147.9707	166.5706	179.0452	201.1049	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	62.7280	55.3895	58.6194	50.9912	49.0597	43.8040	42.9327	44.8586	45.5968	51.3283	55.1723	61.9699	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.9820	2.6934	2.9820	2.8858	2.9820	2.8858	2.9820	2.9820	2.8858	2.9820	2.8858	2.9820	(231)
Lighting	16.4891	13.2282	11.9105	8.7262	6.7403	5.5069	6.1488	7.9924	10.3813	13.6209	15.3847	16.9474	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1278.9343 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	622.4505 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)	
mechanical ventilation fans (SFP = 0.2080)	35.1110 (230a)
Total electricity for the above, kWh/year	35.1110 (231)
Electricity for lighting (calculated in Appendix L)	133.0769 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2069.5727 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1278.9343	27.6700	353.8811	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	622.4505	27.6700	172.2320	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	35.1110	27.6700	9.7152	(249)
Energy for lighting	133.0769	27.6700	36.8224	(250)
Additional standing charges			0.0000	(251)
Total energy cost			572.6508	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1278.9343	0.1570	200.7926	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	622.4505	0.1411	87.8451	(264)
Space and water heating			288.6377	(265)
Pumps, fans and electric keep-hot	35.1110	0.1387	4.8703	(267)
Energy for lighting	133.0769	0.1443	19.2071	(268)
Total CO2, kg/year			312.7152	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1278.9343	1.5812	2022.2746	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	622.4505	1.5219	947.2769	(278)
Space and water heating			2969.5515	(279)
Pumps, fans and electric keep-hot	35.1110	1.5128	53.1159	(281)
Energy for lighting	133.0769	1.5338	204.1177	(282)
Total Primary energy kWh/year			3226.7852	(286)

Summary for Input Data

Plot Reference	P-50	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-50
Plot Address	Flat 18, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	73 C	**DER**	8.30	**TER**	18.69
Environmental	94 A	**% DER < TER**			55.59
CO_2 Emissions (t/year)	0.37	**DFEE**	46.77	**TFEE**	53.81
Compliance Check	See BREL	**% DFEE < TFEE**			13.07
% DPER < TPER	14.36	**DPER**	85.43	**TPER**	99.76

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	North	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	251.66	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	25.82 m	52.47 m²	2.55 m

8.0 Living Area	22.90	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.21	110.00	40.43	27.94	0.00	None	12.49	Enter Gross Area
Communal Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	27.20	25.14	0.70	Stairwell Access Corridor 3	2.06	Enter Gross Area
Lift Shaft Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.25	110.00	5.99	5.99	2.10	Stairwell Stairwell 1	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	14.54	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	106.95

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
ColdRoof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	52.47	52.47	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete plank floor (screed laid on rubber), carpeted	70.00	52.47

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.33			1.20
Patio Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20
Window	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1			0.33			1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Front Door	Communal Wall	West	2.06	
Patio Door	Patio Door	Brickwork	North West	5.42	
West	Window	Brickwork	West	7.07	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	22.15	0.04	0.04	RCD	No
E16 Corner (normal)	Independently assessed	8.55	0.05	0.05	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	2.85	0.04	0.04	RCD	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	5.10	0.00	0.02		No
E2 Other lintels (including other steel lintels)	Independently assessed	6.23	0.05	0.05		Yes
E4 Jamb	Gov Approved Scheme	18.60	0.02	0.02	RCD	Yes
E15 Flat roof with parapet	Table K1 - Default	25.82	0.30	0.30		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	5.10	0.10	0.10	RCD	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	3.77	0.33	0.33	AbbeyCalculated	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	6.30	-0.10	-0.10	RCD	No

Y-value	0.09	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500107
Configuration	2
Manufacturer SFP	0.16
Duct Type	Rigid
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No

Summary for Input Data

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.15	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Pendant	85.00	10.00	850.00	7
Downlight	85.00	10.00	850.00	12

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
SAP Code	691	
In Winter	100.00	
In Summer	324.52	
Controls SAP Code	2605	
Controls description	Programmer and room thermostat	

25.0 Main Heating 2	Database	
Percentage of Heat	0.00	%
Database Ref. No.	104014	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	324.52	
Model Name	aroSTOR 200ltr	
Manufacturer	Vaillant Group UK Ltd	
Controls	2100	
Controls description	Not applicable (heating provides DHW only)	

26.0 Heat Networks	None
27.0 Secondary Heating	None

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store

Summary for Input Data

Insulation Type	Measured Loss	
Cylinder Volume	200.00	L
Loss	1.61	kWh/day

34.0 Small-scale Hydro	None										
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	P-50	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-50
Plot Address	Flat 18, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	73 C	**DER**	8.30	**TER**	18.69
Environmental	94 A	**% DER < TER**			55.59
CO_2 Emissions (t/year)	0.37	**DFEE**	46.77	**TFEE**	53.81
Compliance Check	See BREL	**% DFEE < TFEE**			13.07
% DPER < TPER	14.36	**DPER**	85.43	**TPER**	99.76

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	133.7985	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.1500	(17)
Infiltration rate		0.1075	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0914	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1165	0.1142	0.1119	0.1005	0.0982	0.0868	0.0868	0.0845	0.0914	0.0982	0.1028	0.1074	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.4300	12.4900	27.9400	0.2100	5.8674	110.0000	3073.4000	(29a)
Communal Wall	27.2000	2.0600	25.1400	0.2100	5.2794	110.0000	2765.4001	(29a)
Lift Shaft Wall	5.9900		5.9900	0.1600	0.9584	110.0000	658.9000	(29a)
ColdRoof	52.4700		52.4700	0.0900	4.7223	9.0000	472.2300	(30)
Total net area of external elements Aum(A, m2)			126.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.6010			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Internal Wall 1			106.9500			9.0000	962.5500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13204.7801	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							251.6634	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total	
E7	Party floor between dwellings (in blocks of flats)	22.1500	0.0380	0.8417	
E16	Corner (normal)	8.5500	0.0540	0.4617	
E18	Party wall between dwellings	2.8500	0.0380	0.1083	
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000	
E2	Other lintels (including other steel lintels)	6.2300	0.0500	0.3115	
E4	Jamb	18.6000	0.0160	0.2976	
E15	Flat roof with parapet	25.8200	0.3000	7.7460	
P4	Party wall - Roof (insulation at ceiling level)	5.1000	0.1010	0.5151	
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441	
E17	Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9149 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5159 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	(39)

Average = Sum(39)m / 12 = 66.5927

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	(40)
HLP (average)												1.2692	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)

Energy content (annual) Total = Sum(45)m = 1675.1071

Distribution loss (46)m = 0.15 x (45)m

26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)

Total per year (kWh/year) = Sum(64)m = 1992.4381 (64)

12Total per year (kWh/year) 1992 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	358.2381	366.1326	349.9525	335.5235	316.9621	303.9820	291.2929	292.4466	302.2694	314.2488	335.7378	350.3773	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)
Total gains	409.0607	466.7849	520.6096	594.8937	645.9354	646.0823	614.7651	562.5539	503.9121	434.8039	399.2844	392.0828	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	
alpha	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	
util living area	0.9941	0.9883	0.9735	0.9228	0.8059	0.6242	0.4687	0.5296	0.7837	0.9545	0.9887	0.9951	(86)
MIT	19.5966	19.7848	20.0873	20.4891	20.8036	20.9544	20.9903	20.9832	20.8715	20.4478	19.9439	19.5506	(87)
Th 2	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	(88)
util rest of house	0.9921	0.9844	0.9644	0.8965	0.7463	0.5279	0.3519	0.4064	0.6971	0.9333	0.9842	0.9935	(89)
MIT 2	18.2551	18.4941	18.8748	19.3625	19.7076	19.8408	19.8623	19.8596	19.7818	19.3259	18.6983	18.1965	(90)
Living area fraction										fLA = Living area / (4) =		0.4364	(91)
MIT	18.8406	19.0574	19.4040	19.8542	20.1859	20.3268	20.3546	20.3500	20.2574	19.8156	19.2419	18.7875	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8406	19.0574	19.4040	19.8542	20.1859	20.3268	20.3546	20.3500	20.2574	19.8156	19.2419	18.7875	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9896	0.9807	0.9597	0.8962	0.7646	0.5686	0.4031	0.4603	0.7298	0.9321	0.9809	0.9913	(94)
Useful gains	404.8118	457.7881	499.6473	533.1483	493.8618	367.3483	247.7971	258.9716	367.7470	405.2889	391.6649	388.6904	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	968.2949	942.7821	859.3102	729.4693	565.0994	381.3626	250.0278	263.0427	410.0366	613.6900	808.5644	971.4195	(97)
Space heating kWh	419.2314	325.9159	267.5892	141.3511	53.0008	0.0000	0.0000	0.0000	0.0000	155.0504	300.1676	433.5505	(98a)
Space heating requirement - total per year (kWh/year)												2095.8569	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	419.2314	325.9159	267.5892	141.3511	53.0008	0.0000	0.0000	0.0000	0.0000	155.0504	300.1676	433.5505	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2095.8569	
Space heating per m2											(98c) / (4) =	39.9439	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	419.2314	325.9159	267.5892	141.3511	53.0008	0.0000	0.0000	0.0000	0.0000	155.0504	300.1676	433.5505	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	419.2314	325.9159	267.5892	141.3511	53.0008	0.0000	0.0000	0.0000	0.0000	155.0504	300.1676	433.5505	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2095.8569	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2871.0717	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2095.8569	0.1554	325.7126	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			412.3563	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			435.4390	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.3000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2095.8569	1.5754	3301.7239	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			4236.0724	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			4482.6891	(286)
Dwelling Primary energy Rate (DPER)			85.4300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3995	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)
Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0500	1.1450	12.6527			(27)
Brickwork	40.4300	11.0500	29.3800	0.1800	5.2884			(29a)
Communal Wall	27.2000	2.0600	25.1400	0.1800	4.5252			(29a)
Lift Shaft Wall	5.9900		5.9900	0.1800	1.0782			(29a)
ColdRoof	52.4700		52.4700	0.1100	5.7717			(30)
Total net area of external elements Aum(A, m2)			126.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.3762			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 251.6634 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1500	0.0700	1.5505
E16 Corner (normal)	8.5500	0.0900	0.7695
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0500	0.9300
E15 Flat roof with parapet	25.8200	0.5600	14.4592
P4 Party wall - Roof (insulation at ceiling level)	5.1000	0.1200	0.6120
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.0200	0.0754
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.3121 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.6883 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	75.9029	75.7422	75.5847	74.8450	74.7066	74.0623	74.0623	73.9430	74.3104	74.7066	74.9866	75.2793	(39)
Average = Sum(39)m / 12 =												74.8443	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4466	1.4435	1.4405	1.4264	1.4238	1.4115	1.4115	1.4092	1.4162	1.4238	1.4291	1.4347	(40)
HLP (average)												1.4264	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)
Hot water usage for baths	23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)
Hot water usage for other uses	32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)
Average daily hot water use (litres/day)												100.8506	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	220.3518	194.9791	207.2344	182.2321	176.7131	159.2853	157.1511	163.3000	165.0091	183.9559	195.5810	217.9316	(62)
WWHRS	-24.5851	-21.7433	-22.7683	-18.8531	-17.5704	-15.0351	-14.0930	-14.9865	-15.5559	-18.3387	-20.7755	-24.1298	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
										Total per year (kWh/year) = Sum(64)m =		1995.2899	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	95.0501	84.5056	90.6886	81.6726	80.5402	74.0428	74.0358	76.0804	75.9460	82.9484	86.1111	94.2454	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.6934	86.0177	77.6934	80.2832	77.6934	80.2832	77.6934	77.6934	80.2832	77.6934	80.2832	77.6934	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	127.7555	125.7524	121.8932	113.4342	108.2530	102.8372	99.5106	102.2586	105.4805	111.4898	119.5988	126.6739	(72)
Total internal gains													
	411.5375	419.4531	403.2519	388.8294	370.2615	354.2880	341.5923	342.7459	352.5754	367.5482	389.0438	403.6767	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2500	19.6403	0.6300	0.7000	0.7700	37.5145	(80)
Northwest	4.8000	11.2829	0.6300	0.7000	0.7700	16.5514	(81)

Solar gains	54.0659	107.0772	181.5571	275.9498	350.0156	363.9885	344.1660	287.3781	214.5257	128.2520	67.6021	44.3668	(83)
Total gains	465.6034	526.5303	584.8090	664.7792	720.2771	718.2765	685.7583	630.1240	567.1011	495.8002	456.6459	448.0435	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.3248	48.4273	48.5282	49.0079	49.0987	49.5258	49.5258	49.6057	49.3604	49.0987	48.9153	48.7251	
alpha	4.2217	4.2285	4.2352	4.2672	4.2732	4.3017	4.3017	4.3070	4.2907	4.2732	4.2610	4.2483	
util living area													
	0.9907	0.9835	0.9661	0.9115	0.7955	0.6177	0.4648	0.5217	0.7680	0.9414	0.9831	0.9921	(86)
MIT	19.4449	19.6461	19.9748	20.4201	20.7641	20.9412	20.9862	20.9778	20.8503	20.3994	19.8521	19.4149	(87)
Th 2	19.7278	19.7301	19.7324	19.7431	19.7451	19.7545	19.7545	19.7563	19.7509	19.7451	19.7411	19.7368	(88)
util rest of house													
	0.9876	0.9780	0.9545	0.8813	0.7308	0.5145	0.3385	0.3895	0.6740	0.9145	0.9764	0.9895	(89)
MIT 2	17.9677	18.2238	18.6374	19.1826	19.5596	19.7241	19.7508	19.7494	19.6571	19.1743	18.4949	17.9357	(90)
Living area fraction										fLA = Living area / (4) =		0.4364	(91)
MIT	18.6124	18.8446	19.2211	19.7227	20.0853	20.2553	20.2900	20.2855	20.1779	19.7090	19.0872	18.5813	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6124	18.8446	19.2211	19.7227	20.0853	20.2553	20.2900	20.2855	20.1779	19.7090	19.0872	18.5813	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9729	0.9485	0.8807	0.7499	0.5578	0.3939	0.4474	0.7092	0.9136	0.9717	0.9861	(94)
Useful gains	458.0731	512.2453	554.6859	585.4803	540.1673	400.6434	270.1221	281.9171	402.1947	452.9572	443.7409	441.7944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1086.3562	1056.1930	961.5222	810.0248	626.4394	418.8423	273.2873	287.3088	451.6486	680.4992	898.8807	1082.6126	(97)
Space heating kWh													
	467.4426	365.5329	302.6862	161.6720	64.1865	0.0000	0.0000	0.0000	0.0000	169.2913	327.7007	476.7687	(98a)
Space heating requirement - total per year (kWh/year)												2335.2808	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	467.4426	365.5329	302.6862	161.6720	64.1865	0.0000	0.0000	0.0000	0.0000	169.2913	327.7007	476.7687	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2335.2808	
Space heating per m2											(98c) / (4) =	44.5070	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	467.4426	365.5329	302.6862	161.6720	64.1865	0.0000	0.0000	0.0000	0.0000	169.2913	327.7007	476.7687	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	506.4384	396.0269	327.9374	175.1593	69.5411	0.0000	0.0000	0.0000	0.0000	183.4141	355.0387	516.5425	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9390	85.6925	85.1630	84.0362	82.1942	79.8000	79.8000	79.8000	79.8000	84.1090	85.4476	85.9969	(217)
Fuel for water heating, kWh/month													
	227.7972	202.1599	216.6036	194.4151	193.6179	180.7647	179.2708	185.8566	187.2847	196.9077	204.5762	225.3590	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1432	12.9506	11.6606	8.5431	6.5989	5.3914	6.0197	7.8247	10.1635	13.3351	15.0619	16.5918	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1917	-21.0987	-31.9692	-37.9679	-42.7442	-40.5813	-40.1064	-36.9729	-31.7516	-25.0211	-15.9913	-12.1470	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0149	-10.7905	-21.8964	-33.5491	-45.0032	-45.4345	-44.8804	-37.6891	-27.2324	-15.6258	-6.7591	-3.9466	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2530.0984	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2394.6133	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.2845	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-648.3653	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4492.6309	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2530.0984	0.2100	531.3207	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2394.6133	0.2100	502.8688	(264)
Space and water heating			1034.1895	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.2845	0.1443	18.8041	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5433	0.1335	-46.7857	
PV Unit electricity exported	-297.8220	0.1253	-37.3252	
Total			-84.1110	(269)
Total CO2, kg/year			980.8118	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			18.6900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2530.0984	1.1300	2859.0112	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2394.6133	1.1300	2705.9130	(278)
Space and water heating			5564.9242	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.2845	1.5338	199.8347	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5433	1.4932	-523.4330	
PV Unit electricity exported	-297.8220	0.4600	-137.0015	
Total			-660.4345	(283)
Total Primary energy kWh/year			5234.4252	(286)
Target Primary Energy Rate (TPER)			99.7600	(287)

Full SAP Calculation Printout

Plot Reference	P-50	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-50
Plot Address	Flat 18, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	73 C	**DER**	8.30	**TER**	18.69
Environmental	94 A	**% DER < TER**			55.59
CO_2 Emissions (t/year)	0.37	**DFEE**	46.77	**TFEE**	53.81
Compliance Check	See BREL	**% DFEE < TFEE**			13.07
% DPER < TPER	14.36	**DPER**	85.43	**TPER**	99.76

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700 (1b)	x	2.5500 (2b)	=	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.1500	(17)
Infiltration rate		0.2570	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2184	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2785	0.2730	0.2676	0.2403	0.2348	0.2075	0.2075	0.2020	0.2184	0.2348	0.2457	0.2567	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5388	0.5373	0.5358	0.5289	0.5276	0.5215	0.5215	0.5204	0.5239	0.5276	0.5302	0.5329	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.4300	12.4900	27.9400	0.2100	5.8674	110.0000	3073.4000	(29a)
Communal Wall	27.2000	2.0600	25.1400	0.2100	5.2794	110.0000	2765.4001	(29a)
Lift Shaft Wall	5.9900		5.9900	0.1600	0.9584	110.0000	658.9000	(29a)
ColdRoof	52.4700		52.4700	0.0900	4.7223	9.0000	472.2300	(30)
Total net area of external elements Aum(A, m2)			126.0900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.6010			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Internal Wall 1			106.9500			9.0000	962.5500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13204.7801 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		251.6634 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	22.1500	0.0380	0.8417	
E16 Corner (normal)	8.5500	0.0540	0.4617	
E18 Party wall between dwellings	2.8500	0.0380	0.1083	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115	
E4 Jamb	18.6000	0.0160	0.2976	
E15 Flat roof with parapet	25.8200	0.3000	7.7460	
P4 Party wall - Roof (insulation at ceiling level)	5.1000	0.1010	0.5151	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441	
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.9149 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	44.5159 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.7891	23.7226	23.6574	23.3513	23.2940	23.0274	23.0274	22.9780	23.1301	23.2940	23.4099	23.5310	(38)
Heat transfer coeff	68.3050	68.2385	68.1733	67.8672	67.8099	67.5433	67.5433	67.4939	67.6460	67.8099	67.9258	68.0469	(39)
Average = Sum(39)m / 12 =												67.8669	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3018	1.3005	1.2993	1.2934	1.2924	1.2873	1.2873	1.2863	1.2892	1.2924	1.2946	1.2969	(40)
HLP (average)												1.2934	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 51.2690 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.9338	54.4000	52.7252	50.6402	48.7804	46.8475	46.4454	48.1167	49.8310	51.8160	53.9195	55.8552	(44)
Energy conte	88.5855	77.4649	81.0367	69.3239	65.6677	57.6044	56.1717	59.5786	61.4466	70.3138	76.8182	87.4557	(45)
Energy content (annual)										Total = Sum(45)m =		851.4677	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(64)
							Total per year (kWh/year) = Sum(64)m =				723.7475	(64)
12Total per year (kWh/year)											724	(64)

Electric shower(s)

43.0673	38.3733	41.9022	39.9868	40.7371	38.8592	40.1546	40.7371	39.9868	41.9022	41.1143	43.0673	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							489.8882	(64a)

Heat gains from water heating, kWh/month

29.5912	26.0546	27.6959	24.7280	24.1387	21.9557	21.9751	22.8447	23.0541	25.4172	26.6024	29.3512	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	39.7732	38.7718	37.2256	34.3445	32.4444	30.4941	29.5364	30.7053	32.0196	34.1630	36.9478	39.4505	(72)
Total internal gains	320.3579	329.2540	315.3870	306.5358	291.2556	281.7409	271.4208	270.9953	278.9105	287.0240	303.1890	313.2560	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)
Total gains	371.1805	429.9062	486.0441	565.9060	620.2289	623.8412	594.8931	541.1027	480.5532	407.5791	366.7355	354.9614	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	53.7002	53.7526	53.8039	54.0466	54.0923	54.3058	54.3058	54.3455	54.2234	54.0923	54.0000	53.9039	
alpha	4.5800	4.5835	4.5869	4.6031	4.6062	4.6204	4.6204	4.6230	4.6149	4.6062	4.6000	4.5936	
util living area	0.9960	0.9917	0.9800	0.9361	0.8284	0.6482	0.4892	0.5542	0.8097	0.9646	0.9921	0.9968	(86)
MIT	19.4751	19.6699	19.9865	20.4226	20.7685	20.9446	20.9878	20.9789	20.8461	20.3817	19.8507	19.4373	(87)
Th 2	19.8394	19.8404	19.8414	19.8460	19.8468	19.8508	19.8508	19.8516	19.8493	19.8468	19.8451	19.8433	(88)
util rest of house	0.9947	0.9889	0.9729	0.9130	0.7710	0.5497	0.3668	0.4255	0.7257	0.9472	0.9888	0.9957	(89)
MIT 2	18.4703	18.6645	18.9773	19.3979	19.6998	19.8275	19.8481	19.8462	19.7696	19.3694	18.8488	18.4357	(90)
Living area fraction										fLA = Living area / (4) =		0.4364	(91)
MIT	18.9088	19.1033	19.4178	19.8451	20.1662	20.3151	20.3455	20.3406	20.2394	19.8112	19.2860	18.8728	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9088	19.1033	19.4178	19.8451	20.1662	20.3151	20.3455	20.3406	20.2394	19.8112	19.2860	18.8728	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9865	0.9696	0.9130	0.7885	0.5912	0.4205	0.4820	0.7572	0.9465	0.9867	0.9944	(94)
Useful gains	368.6554	424.0816	471.2528	516.6448	489.0347	368.8409	250.1622	260.7974	363.8909	385.7643	361.8553	352.9774	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	997.8550	969.2127	880.6482	742.8146	574.0940	386.0142	252.9829	265.9635	415.3083	624.6107	827.7458	998.4417	(97)
Space heating kWh	468.1245	366.3281	304.5902	162.8423	63.2841	0.0000	0.0000	0.0000	0.0000	177.7018	335.4411	480.2255	(98a)
Space heating requirement - total per year (kWh/year)												2358.5376	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	468.1245	366.3281	304.5902	162.8423	63.2841	0.0000	0.0000	0.0000	0.0000	177.7018	335.4411	480.2255	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2358.5376	
Space heating per m2											(98c) / (4) =	44.9502	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	634.9072	499.8205	512.9539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8604	0.9184	0.8841	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	546.2884	459.0507	453.5074	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	701.4083	669.1055	607.7169	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	111.6864	156.2808	114.7319	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.9216	39.0702	28.6830	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												95.6748	(107)
Energy for space heating												44.9502	(99)
Energy for space cooling												1.8234	(108)
Total												46.7736	(109)
Fabric Energy Efficiency (DFEE)												46.8	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		133.7985	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) =	0.1495	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3995	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0500	1.1450	12.6527			(27)
Brickwork	40.4300	11.0500	29.3800	0.1800	5.2884			(29a)
Communal Wall	27.2000	2.0600	25.1400	0.1800	4.5252			(29a)
Lift Shaft Wall	5.9900		5.9900	0.1800	1.0782			(29a)
ColdRoof	52.4700		52.4700	0.1100	5.7717			(30)
Total net area of external elements Aum(A, m2)			126.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.3762			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	251.6634	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1500	0.0700	1.5505
E16 Corner (normal)	8.5500	0.0900	0.7695
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0500	0.9300
E15 Flat roof with parapet	25.8200	0.5600	14.4592
P4 Party wall - Roof (insulation at ceiling level)	5.1000	0.1200	0.6120
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.0200	0.0754
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	18.3121	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	49.6883	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	75.9029	75.7422	75.5847	74.8450	74.7066	74.0623	74.0623	73.9430	74.3104	74.7066	74.9866	75.2793	(39)
Average = Sum(39)m / 12 =												74.8443	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4466	1.4435	1.4405	1.4264	1.4238	1.4115	1.4115	1.4092	1.4162	1.4238	1.4291	1.4347	(40)
HLP (average)												1.4264	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7629	(42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)	51.2690	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	55.9338	54.4000	52.7252	50.6402	48.7804	46.8475	46.4454	48.1167	49.8310	51.8160	53.9195	55.8552	(44)
Energy conte	88.5855	77.4649	81.0367	69.3239	65.6677	57.6044	56.1717	59.5786	61.4466	70.3138	76.8182	87.4557	(45)
Energy content (annual)										Total = Sum(45)m =		851.4677	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

75.2976	65.8451	68.8812	58.9253	55.8176	48.9637	47.7459	50.6418	52.2296	59.7667	65.2955	74.3374	(64)
									Total per year (kWh/year) = Sum(64)m =		723.7475	(64)
12Total per year (kWh/year)											724	(64)

Electric shower(s)

43.0673	38.3733	41.9022	39.9868	40.7371	38.8592	40.1546	40.7371	39.9868	41.9022	41.1143	43.0673	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	489.8882	(64a)

Heat gains from water heating, kWh/month

29.5912	26.0546	27.6959	24.7280	24.1387	21.9557	21.9751	22.8447	23.0541	25.4172	26.6024	29.3512	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.6934	86.0177	77.6934	80.2832	77.6934	80.2832	77.6934	77.6934	80.2832	77.6934	80.2832	77.6934	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	39.7732	38.7718	37.2256	34.3445	32.4444	30.4941	29.5364	30.7053	32.0196	34.1630	36.9478	39.4505	(72)
Total internal gains													
	320.5552	329.4724	315.5843	306.7397	291.4530	281.9448	271.6182	271.1926	279.1144	287.2213	303.3929	313.4533	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2500	19.6403	0.6300	0.7000	0.7700	37.5145	(80)
Northwest	4.8000	11.2829	0.6300	0.7000	0.7700	16.5514	(81)

Solar gains	54.0659	107.0772	181.5571	275.9498	350.0156	363.9885	344.1660	287.3781	214.5257	128.2520	67.6021	44.3668	(83)
Total gains	374.6211	436.5497	497.1414	582.6895	641.4685	645.9333	615.7842	558.5707	493.6402	415.4733	370.9950	357.8202	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.3248	48.4273	48.5282	49.0079	49.0987	49.5258	49.5258	49.6057	49.3604	49.0987	48.9153	48.7251	
alpha	4.2217	4.2285	4.2352	4.2672	4.2732	4.3017	4.3017	4.3070	4.2907	4.2732	4.2610	4.2483	
util living area													
	0.9959	0.9916	0.9805	0.9398	0.8412	0.6698	0.5125	0.5786	0.8261	0.9667	0.9921	0.9966	(86)
MIT	19.2748	19.4822	19.8251	20.3071	20.6996	20.9198	20.9800	20.9672	20.7965	20.2733	19.6957	19.2450	(87)
Th 2	19.7278	19.7301	19.7324	19.7431	19.7451	19.7545	19.7545	19.7563	19.7509	19.7451	19.7411	19.7368	(88)
util rest of house													
	0.9945	0.9887	0.9733	0.9169	0.7831	0.5642	0.3757	0.4367	0.7403	0.9496	0.9887	0.9955	(89)
MIT 2	18.1878	18.3954	18.7355	19.2065	19.5540	19.7209	19.7501	19.7480	19.6453	19.1862	18.6170	18.1648	(90)
Living area fraction										fLA = Living area / (4) =		0.4364	(91)
MIT	18.6622	18.8697	19.2111	19.6868	20.0540	20.2441	20.2869	20.2801	20.1477	19.6606	19.0877	18.6363	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6622	18.8697	19.2111	19.6868	20.0540	20.2441	20.2869	20.2801	20.1477	19.6606	19.0877	18.6363	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9860	0.9694	0.9157	0.7991	0.6081	0.4359	0.4990	0.7711	0.9481	0.9863	0.9940	(94)
Useful gains	371.9047	430.4202	481.9289	533.5428	512.5826	392.8228	268.4013	278.7521	380.6428	393.8967	365.9294	355.6732	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1090.1336	1058.0987	960.7629	807.3389	624.0983	418.0185	273.0616	286.9055	449.4078	676.8889	898.9195	1086.7515	(97)
Space heating kWh													
	534.3623	421.8000	356.2525	197.1332	82.9677	0.0000	0.0000	0.0000	0.0000	210.5462	383.7529	543.9223	(98a)
Space heating requirement - total per year (kWh/year)												2730.7369	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	534.3623	421.8000	356.2525	197.1332	82.9677	0.0000	0.0000	0.0000	0.0000	210.5462	383.7529	543.9223	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2730.7369	
Space heating per m2											(98c) / (4) =	52.0438	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	696.1853	548.0608	561.9664	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8285	0.8930	0.8537	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	576.8088	489.4399	479.7380	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	727.0092	693.3117	627.9278	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	108.1444	151.6806	110.2532	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	27.0361	37.9202	27.5633	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												92.5195	(107)
Energy for space heating												52.0438	(99)
Energy for space cooling												1.7633	(108)
Total												53.8071	(109)
Fabric Energy Efficiency (TFEE)												53.8	(109)

Full SAP Calculation Printout

Plot Reference	P-50	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-50
Plot Address	Flat 18, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	73 C	**DER**	8.30	**TER**	18.69
Environmental	94 A	**% DER < TER**			55.59
CO_2 Emissions (t/year)	0.37	**DFEE**	46.77	**TFEE**	53.81
Compliance Check	See BREL	**% DFEE < TFEE**			13.07
% DPER < TPER	14.36	**DPER**	85.43	**TPER**	99.76

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	133.7985	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.1500	(17)
Infiltration rate		0.1075	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0914	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1165	0.1142	0.1119	0.1005	0.0982	0.0868	0.0868	0.0845	0.0914	0.0982	0.1028	0.1074	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.4300	12.4900	27.9400	0.2100	5.8674	110.0000	3073.4000	(29a)
Communal Wall	27.2000	2.0600	25.1400	0.2100	5.2794	110.0000	2765.4001	(29a)
Lift Shaft Wall	5.9900		5.9900	0.1600	0.9584	110.0000	658.9000	(29a)
ColdRoof	52.4700		52.4700	0.0900	4.7223	9.0000	472.2300	(30)
Total net area of external elements Aum(A, m2)			126.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.6010			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Internal Wall 1			106.9500			9.0000	962.5500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13204.7801	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							251.6634	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total	
E7	Party floor between dwellings (in blocks of flats)	22.1500	0.0380	0.8417	
E16	Corner (normal)	8.5500	0.0540	0.4617	
E18	Party wall between dwellings	2.8500	0.0380	0.1083	
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000	
E2	Other lintels (including other steel lintels)	6.2300	0.0500	0.3115	
E4	Jamb	18.6000	0.0160	0.2976	
E15	Flat roof with parapet	25.8200	0.3000	7.7460	
P4	Party wall - Roof (insulation at ceiling level)	5.1000	0.1010	0.5151	
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441	
E17	Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9149 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5159 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	(39)

Average = Sum(39)m / 12 = 66.5927

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	(40)
HLP (average)												1.2692	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)

Energy content (annual) Total = Sum(45)m = 1675.1071

Distribution loss (46)m = 0.15 x (45)m

26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)

Total per year (kWh/year) = Sum(64)m = 1992.4381 (64)

12Total per year (kWh/year) 1992 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4961	85.7992	77.4961	80.0793	77.4961	80.0793	77.4961	77.4961	80.0793	77.4961	80.0793	77.4961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	358.2381	366.1326	349.9525	335.5235	316.9621	303.9820	291.2929	292.4466	302.2694	314.2488	335.7378	350.3773	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)
Total gains	409.0607	466.7849	520.6096	594.8937	645.9354	646.0823	614.7651	562.5539	503.9121	434.8039	399.2844	392.0828	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	
alpha	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	
util living area	0.9941	0.9883	0.9735	0.9228	0.8059	0.6242	0.4687	0.5296	0.7837	0.9545	0.9887	0.9951	(86)
MIT	19.5966	19.7848	20.0873	20.4891	20.8036	20.9544	20.9903	20.9832	20.8715	20.4478	19.9439	19.5506	(87)
Th 2	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	(88)
util rest of house	0.9921	0.9844	0.9644	0.8965	0.7463	0.5279	0.3519	0.4064	0.6971	0.9333	0.9842	0.9935	(89)
MIT 2	18.2551	18.4941	18.8748	19.3625	19.7076	19.8408	19.8623	19.8596	19.7818	19.3259	18.6983	18.1965	(90)
Living area fraction										fLA = Living area / (4) =		0.4364	(91)
MIT	18.8406	19.0574	19.4040	19.8542	20.1859	20.3268	20.3546	20.3500	20.2574	19.8156	19.2419	18.7875	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8406	19.0574	19.4040	19.8542	20.1859	20.3268	20.3546	20.3500	20.2574	19.8156	19.2419	18.7875	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9896	0.9807	0.9597	0.8962	0.7646	0.5686	0.4031	0.4603	0.7298	0.9321	0.9809	0.9913	(94)
Useful gains	404.8118	457.7881	499.6473	533.1483	493.8618	367.3483	247.7971	258.9716	367.7470	405.2889	391.6649	388.6904	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	968.2949	942.7821	859.3102	729.4693	565.0994	381.3626	250.0278	263.0427	410.0366	613.6900	808.5644	971.4195	(97)
Space heating kWh	419.2314	325.9159	267.5892	141.3511	53.0008	0.0000	0.0000	0.0000	0.0000	155.0504	300.1676	433.5505	(98a)
Space heating requirement - total per year (kWh/year)												2095.8569	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	419.2314	325.9159	267.5892	141.3511	53.0008	0.0000	0.0000	0.0000	0.0000	155.0504	300.1676	433.5505	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2095.8569	
Space heating per m2											(98c) / (4) =	39.9439	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	419.2314	325.9159	267.5892	141.3511	53.0008	0.0000	0.0000	0.0000	0.0000	155.0504	300.1676	433.5505	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	419.2314	325.9159	267.5892	141.3511	53.0008	0.0000	0.0000	0.0000	0.0000	155.0504	300.1676	433.5505	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2095.8569	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2871.0717	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2095.8569	0.1554	325.7126	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			412.3563	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			435.4390	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.3000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2095.8569	1.5754	3301.7239	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			4236.0724	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			4482.6891	(286)
Dwelling Primary energy Rate (DPER)			85.4300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1495	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3995	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3396	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4329	0.4244	0.4160	0.3735	0.3650	0.3226	0.3226	0.3141	0.3396	0.3650	0.3820	0.3990	(22b)
Effective ac	0.5937	0.5901	0.5865	0.5698	0.5666	0.5520	0.5520	0.5493	0.5576	0.5666	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type			11.0500	1.1450	12.6527			(27)
Brickwork	40.4300	11.0500	29.3800	0.1800	5.2884			(29a)
Communal Wall	27.2000	2.0600	25.1400	0.1800	4.5252			(29a)
Lift Shaft Wall	5.9900		5.9900	0.1800	1.0782			(29a)
ColdRoof	52.4700		52.4700	0.1100	5.7717			(30)
Total net area of external elements Aum(A, m2)			126.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.3762			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 251.6634 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1500	0.0700	1.5505
E16 Corner (normal)	8.5500	0.0900	0.7695
E18 Party wall between dwellings	2.8500	0.0600	0.1710
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0500	0.9300
E15 Flat roof with parapet	25.8200	0.5600	14.4592
P4 Party wall - Roof (insulation at ceiling level)	5.1000	0.1200	0.6120
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.0200	0.0754
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.3121 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.6883 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2147	26.0540	25.8965	25.1567	25.0183	24.3740	24.3740	24.2547	24.6222	25.0183	25.2983	25.5910	(38)
Heat transfer coeff	75.9029	75.7422	75.5847	74.8450	74.7066	74.0623	74.0623	73.9430	74.3104	74.7066	74.9866	75.2793	(39)
Average = Sum(39)m / 12 =												74.8443	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4466	1.4435	1.4405	1.4264	1.4238	1.4115	1.4115	1.4092	1.4162	1.4238	1.4291	1.4347	(40)
HLP (average)												1.4264	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)
Hot water usage for baths	23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)
Hot water usage for other uses	32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)
Average daily hot water use (litres/day)												100.8506	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	220.3518	194.9791	207.2344	182.2321	176.7131	159.2853	157.1511	163.3000	165.0091	183.9559	195.5810	217.9316	(62)
WWHRS	-24.5851	-21.7433	-22.7683	-18.8531	-17.5704	-15.0351	-14.0930	-14.9865	-15.5559	-18.3387	-20.7755	-24.1298	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
										Total per year (kWh/year) = Sum(64)m =		1995.2899	(64)
12Total per year (kWh/year)												1995	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	95.0501	84.5056	90.6886	81.6726	80.5402	74.0428	74.0358	76.0804	75.9460	82.9484	86.1111	94.2454	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	88.1467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.6934	86.0177	77.6934	80.2832	77.6934	80.2832	77.6934	77.6934	80.2832	77.6934	80.2832	77.6934	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.6446	155.2390	151.2213	142.6680	131.8711	121.7235	114.9443	113.3500	117.3677	125.9209	136.7178	146.8654	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	31.8147	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	127.7555	125.7524	121.8932	113.4342	108.2530	102.8372	99.5106	102.2586	105.4805	111.4898	119.5988	126.6739	(72)
Total internal gains													
	411.5375	419.4531	403.2519	388.8294	370.2615	354.2880	341.5923	342.7459	352.5754	367.5482	389.0438	403.6767	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.2500	19.6403	0.6300	0.7000	0.7700	37.5145	(80)
Northwest	4.8000	11.2829	0.6300	0.7000	0.7700	16.5514	(81)

Solar gains	54.0659	107.0772	181.5571	275.9498	350.0156	363.9885	344.1660	287.3781	214.5257	128.2520	67.6021	44.3668	(83)
Total gains	465.6034	526.5303	584.8090	664.7792	720.2771	718.2765	685.7583	630.1240	567.1011	495.8002	456.6459	448.0435	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.3248	48.4273	48.5282	49.0079	49.0987	49.5258	49.5258	49.6057	49.3604	49.0987	48.9153	48.7251	
alpha	4.2217	4.2285	4.2352	4.2672	4.2732	4.3017	4.3017	4.3070	4.2907	4.2732	4.2610	4.2483	
util living area													
	0.9907	0.9835	0.9661	0.9115	0.7955	0.6177	0.4648	0.5217	0.7680	0.9414	0.9831	0.9921	(86)
MIT	19.4449	19.6461	19.9748	20.4201	20.7641	20.9412	20.9862	20.9778	20.8503	20.3994	19.8521	19.4149	(87)
Th 2	19.7278	19.7301	19.7324	19.7431	19.7451	19.7545	19.7545	19.7563	19.7509	19.7451	19.7411	19.7368	(88)
util rest of house													
	0.9876	0.9780	0.9545	0.8813	0.7308	0.5145	0.3385	0.3895	0.6740	0.9145	0.9764	0.9895	(89)
MIT 2	17.9677	18.2238	18.6374	19.1826	19.5596	19.7241	19.7508	19.7494	19.6571	19.1743	18.4949	17.9357	(90)
Living area fraction										fLA = Living area / (4) =		0.4364	(91)
MIT	18.6124	18.8446	19.2211	19.7227	20.0853	20.2553	20.2900	20.2855	20.1779	19.7090	19.0872	18.5813	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6124	18.8446	19.2211	19.7227	20.0853	20.2553	20.2900	20.2855	20.1779	19.7090	19.0872	18.5813	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9729	0.9485	0.8807	0.7499	0.5578	0.3939	0.4474	0.7092	0.9136	0.9717	0.9861	(94)
Useful gains	458.0731	512.2453	554.6859	585.4803	540.1673	400.6434	270.1221	281.9171	402.1947	452.9572	443.7409	441.7944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1086.3562	1056.1930	961.5222	810.0248	626.4394	418.8423	273.2873	287.3088	451.6486	680.4992	898.8807	1082.6126	(97)
Space heating kWh													
	467.4426	365.5329	302.6862	161.6720	64.1865	0.0000	0.0000	0.0000	0.0000	169.2913	327.7007	476.7687	(98a)
Space heating requirement - total per year (kWh/year)												2335.2808	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	467.4426	365.5329	302.6862	161.6720	64.1865	0.0000	0.0000	0.0000	0.0000	169.2913	327.7007	476.7687	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2335.2808	
Space heating per m2											(98c) / (4) =	44.5070	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	467.4426	365.5329	302.6862	161.6720	64.1865	0.0000	0.0000	0.0000	0.0000	169.2913	327.7007	476.7687	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	506.4384	396.0269	327.9374	175.1593	69.5411	0.0000	0.0000	0.0000	0.0000	183.4141	355.0387	516.5425	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	195.7667	173.2358	184.4661	163.3791	159.1427	144.2502	143.0581	148.3135	149.4532	165.6172	174.8055	193.8018	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9390	85.6925	85.1630	84.0362	82.1942	79.8000	79.8000	79.8000	79.8000	84.1090	85.4476	85.9969	(217)
Fuel for water heating, kWh/month													
	227.7972	202.1599	216.6036	194.4151	193.6179	180.7647	179.2708	185.8566	187.2847	196.9077	204.5762	225.3590	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.1432	12.9506	11.6606	8.5431	6.5989	5.3914	6.0197	7.8247	10.1635	13.3351	15.0619	16.5918	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1917	-21.0987	-31.9692	-37.9679	-42.7442	-40.5813	-40.1064	-36.9729	-31.7516	-25.0211	-15.9913	-12.1470	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0149	-10.7905	-21.8964	-33.5491	-45.0032	-45.4345	-44.8804	-37.6891	-27.2324	-15.6258	-6.7591	-3.9466	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2530.0984	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2394.6133	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.2845	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-648.3653	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4492.6309	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2530.0984	0.2100	531.3207	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2394.6133	0.2100	502.8688	(264)
Space and water heating			1034.1895	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.2845	0.1443	18.8041	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5433	0.1335	-46.7857	
PV Unit electricity exported	-297.8220	0.1253	-37.3252	
Total			-84.1110	(269)
Total CO2, kg/year			980.8118	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			18.6900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2530.0984	1.1300	2859.0112	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2394.6133	1.1300	2705.9130	(278)
Space and water heating			5564.9242	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.2845	1.5338	199.8347	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-350.5433	1.4932	-523.4330	
PV Unit electricity exported	-297.8220	0.4600	-137.0015	
Total			-660.4345	(283)
Total Primary energy kWh/year			5234.4252	(286)
Target Primary Energy Rate (TPER)			99.7600	(287)

Full SAP Calculation Printout

Plot Reference	P-50	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	P-50
Plot Address	Flat 18, 3 Carters Close, READING, RG1 8GR	**SAP Version**	10.2

SAP Rating	73 C	**DER**	8.30	**TER**	18.69
Environmental	94 A	**% DER < TER**			55.59
CO_2 Emissions (t/year)	0.37	**DFEE**	46.77	**TFEE**	53.81
Compliance Check	See BREL	**% DFEE < TFEE**			13.07
% DPER < TPER	14.36	**DPER**	85.43	**TPER**	99.76

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	133.7985	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.1500	(17)
Infiltration rate		0.1075	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0914	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1165	0.1142	0.1119	0.1005	0.0982	0.0868	0.0868	0.0845	0.0914	0.0982	0.1028	0.1074	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.4300	12.4900	27.9400	0.2100	5.8674	110.0000	3073.4000	(29a)
Communal Wall	27.2000	2.0600	25.1400	0.2100	5.2794	110.0000	2765.4001	(29a)
Lift Shaft Wall	5.9900		5.9900	0.1600	0.9584	110.0000	658.9000	(29a)
ColdRoof	52.4700		52.4700	0.0900	4.7223	9.0000	472.2300	(30)
Total net area of external elements Aum(A, m2)			126.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.6010			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Internal Wall 1			106.9500			9.0000	962.5500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13204.7801 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		251.6634 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1500	0.0380	0.8417
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E15 Flat roof with parapet	25.8200	0.3000	7.7460
P4 Party wall - Roof (insulation at ceiling level)	5.1000	0.1010	0.5151
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9149 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5159 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	(39)
Average = Sum(39)m / 12 =												66.5927	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	(40)
HLP (average)												1.2692	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)

Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	

Distribution loss (46)m = 0.15 x (45)m

26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
								Total per year (kWh/year) = Sum(64)m =			1992.4381	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)
Total gains	458.4159	506.6073	563.7674	628.0933	673.9123	665.3305	633.7584	582.7767	526.5195	467.3695	437.0728	438.5997	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	
alpha	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	
util living area	0.9906	0.9839	0.9646	0.9090	0.7872	0.6093	0.4555	0.5129	0.7634	0.9420	0.9839	0.9923	(86)
MIT	19.6910	19.8587	20.1610	20.5328	20.8233	20.9587	20.9914	20.9853	20.8855	20.4981	20.0141	19.6402	(87)
Th 2	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	(88)
util rest of house	0.9875	0.9787	0.9531	0.8796	0.7256	0.5141	0.3416	0.3928	0.6750	0.9165	0.9778	0.9898	(89)
MIT 2	18.3748	18.5868	18.9647	19.4113	19.7254	19.8433	19.8626	19.8604	19.7923	19.3835	18.7860	18.3103	(90)
Living area fraction										fLA = Living area / (4) =		0.4364	(91)
MIT	18.9492	19.1419	19.4868	19.9008	20.2046	20.3301	20.3552	20.3513	20.2694	19.8699	19.3220	18.8907	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9492	19.1419	19.4868	19.9008	20.2046	20.3301	20.3552	20.3513	20.2694	19.8699	19.3220	18.8907	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9744	0.9483	0.8806	0.7455	0.5545	0.3915	0.4454	0.7091	0.9166	0.9739	0.9869	(94)
Useful gains	451.1834	493.6307	534.6088	553.1205	502.3696	368.9227	248.0969	259.5752	373.3324	428.3885	425.6556	432.8373	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	975.5302	948.4066	864.8252	732.5726	566.3416	381.5806	250.0716	263.1293	410.8372	617.3094	813.8957	978.2956	(97)
Space heating kWh	390.1141	305.6095	245.6810	129.2055	47.5951	0.0000	0.0000	0.0000	0.0000	140.5571	279.5328	405.8209	(98a)
Space heating requirement - total per year (kWh/year)												1944.1161	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	390.1141	305.6095	245.6810	129.2055	47.5951	0.0000	0.0000	0.0000	0.0000	140.5571	279.5328	405.8209	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1944.1161	
Space heating per m2											(98c) / (4) =	37.0520	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	390.1141	305.6095	245.6810	129.2055	47.5951	0.0000	0.0000	0.0000	0.0000	140.5571	279.5328	405.8209	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	390.1141	305.6095	245.6810	129.2055	47.5951	0.0000	0.0000	0.0000	0.0000	140.5571	279.5328	405.8209	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1944.1161	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2719.3308	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1944.1161	16.4900	320.5847	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	16.4900	101.2428	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	16.4900	5.5988	(249)
Energy for lighting	127.2974	16.4900	20.9913	(250)
Additional standing charges			0.0000	(251)
Total energy cost			448.4177	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6562	(257)
SAP value		73.1529	
SAP rating (Section 12)		73	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1944.1161	0.1555	302.3083	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			388.9520	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			412.0346	(272)
CO2 emissions per m2			7.8500	(273)
EI value			94.3354	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	133.7985	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.1500	(17)

Infiltration rate												0.1075	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.0914	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate													
	0.0982	0.0937	0.0937	0.0868	0.0891	0.0777	0.0777	0.0754	0.0777	0.0868	0.0845	0.0914	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.4300	12.4900	27.9400	0.2100	5.8674	110.0000	3073.4000	(29a)
Communal Wall	27.2000	2.0600	25.1400	0.2100	5.2794	110.0000	2765.4001	(29a)
Lift Shaft Wall	5.9900		5.9900	0.1600	0.9584	110.0000	658.9000	(29a)
ColdRoof	52.4700		52.4700	0.0900	4.7223	9.0000	472.2300	(30)
Total net area of external elements Aum(A, m2)			126.0900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.6010			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Internal Wall 1			106.9500			9.0000	962.5500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13204.7801 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		251.6634 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	22.1500	0.0380	0.8417
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E15 Flat roof with parapet	25.8200	0.3000	7.7460
P4 Party wall - Roof (insulation at ceiling level)	5.1000	0.1010	0.5151
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.9149 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5159 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	(39)
Average = Sum(39)m / 12 =												66.5927	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	(40)
HLP (average)												1.2692	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7629 (42)

Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)		100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)											Total = Sum(45)m =	1675.1071	

Distribution loss (46)m = 0.15 x (45)m

26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)

Water storage loss (or HIU loss):		
Store volume		200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.6100 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.8694 (55)

Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)

Total per year (kWh/year) = Sum(64)m = 1992.4381 (64)

Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains													
	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(81)
West	7.0700	23.8018	0.3300	0.0000	0.7700	42.7596	(80)

Solar gains	61.7383	107.0049	180.1846	277.6073	342.3516	376.1742	352.3549	302.2168	226.8606	137.6114	76.0861	50.9254	(83)
Total gains	469.3315	512.9598	573.2949	646.3303	687.2905	699.4044	662.6410	614.8861	551.7374	484.4258	449.6123	447.8196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	
alpha	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	
util living area													
	0.9874	0.9795	0.9532	0.8741	0.7119	0.4856	0.3304	0.3660	0.6715	0.9137	0.9769	0.9896	(86)
MIT	19.8155	19.9726	20.2854	20.6534	20.9004	20.9867	20.9983	20.9973	20.9422	20.6220	20.1516	19.7752	(87)
Th 2	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	(88)
util rest of house													
	0.9832	0.9726	0.9375	0.8344	0.6357	0.3842	0.2174	0.2450	0.5660	0.8760	0.9677	0.9860	(89)
MIT 2	18.5331	18.7307	19.1180	19.5477	19.7964	19.8600	19.8648	19.8647	19.8352	19.5263	18.9588	18.4823	(90)
Living area fraction										fLA = Living area / (4) =		0.4364	(91)
MIT	19.0928	19.2727	19.6275	20.0303	20.2782	20.3518	20.3595	20.3590	20.3184	20.0045	19.4794	19.0466	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0928	19.2727	19.6275	20.0303	20.2782	20.3518	20.3595	20.3590	20.3184	20.0045	19.4794	19.0466	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9681	0.9335	0.8409	0.6650	0.4284	0.2669	0.2981	0.6104	0.8814	0.9637	0.9826	(94)
Useful gains	459.6792	496.5730	535.1503	543.4713	457.0214	299.6294	176.8325	183.2726	336.7722	426.9724	433.2981	440.0177	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	931.8190	903.8447	814.2624	674.6038	491.3341	303.1140	177.1055	183.7291	354.1635	566.3369	764.4433	928.7391	(97)
Space heating kWh													
	351.2721	273.6866	207.6593	94.4154	25.5287	0.0000	0.0000	0.0000	0.0000	103.6872	238.4245	363.6088	(98a)
Space heating requirement - total per year (kWh/year)												1658.2827	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	351.2721	273.6866	207.6593	94.4154	25.5287	0.0000	0.0000	0.0000	0.0000	103.6872	238.4245	363.6088	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1658.2827	
Space heating per m2											(98c) / (4) =	31.6044	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	351.2721	273.6866	207.6593	94.4154	25.5287	0.0000	0.0000	0.0000	0.0000	103.6872	238.4245	363.6088	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	351.2721	273.6866	207.6593	94.4154	25.5287	0.0000	0.0000	0.0000	0.0000	103.6872	238.4245	363.6088	(211)

Space heating efficiency (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Space heating fuel used, main system 2 0.0000 (213)

Water heating

Water heating requirement

200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)

Efficiency of water heater 324.5200 (216)

(217)m 324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)

Fuel for water heating, kWh/month

61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting 15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1658.2827 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 324.5200
Water heating fuel used 613.9647 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)
mechanical ventilation fans (SFP = 0.2080) 33.9527 (230a)
Total electricity for the above, kWh/year 33.9527 (231)
Electricity for lighting (calculated in Appendix L) 127.2974 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 2433.4974 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1658.2827	27.6700	458.8468	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	27.6700	169.8840	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	27.6700	9.3947	(249)
Energy for lighting	127.2974	27.6700	35.2232	(250)
Additional standing charges			0.0000	(251)
Total energy cost			673.3487	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1658.2827	0.1562	259.0621	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			345.7058	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			368.7884	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1658.2827	1.5784	2617.3867	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			3551.7352	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			3798.3519	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: C 73
Current environmental impact rating: A 94

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: C 73
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£673	£673	£0
Space heating	£468	£468	£0
Water heating	£170	£170	£0
Lighting	£35	£35	£0
Total cost of fuels	£673	£673	£0
Total cost of uses	£673	£673	£0
Delivered energy	46 kWh/m²	46 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	72 kWh/m²	72 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700	(1b)	x 2.5500	(2b) =	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.1500	(17)
Infiltration rate		0.1075	(18)
Number of sides sheltered		2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.0914	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1165	0.1142	0.1119	0.1005	0.0982	0.0868	0.0868	0.0845	0.0914	0.0982	0.1028	0.1074	(22b)

Mechanical extract ventilation - centralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.4300	12.4900	27.9400	0.2100	5.8674	110.0000	3073.4000	(29a)
Communal Wall	27.2000	2.0600	25.1400	0.2100	5.2794	110.0000	2765.4001	(29a)
Lift Shaft Wall	5.9900		5.9900	0.1600	0.9584	110.0000	658.9000	(29a)
ColdRoof	52.4700		52.4700	0.0900	4.7223	9.0000	472.2300	(30)
Total net area of external elements Aum(A, m2)			126.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.6010			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Internal Wall 1			106.9500			9.0000	962.5500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13204.7801 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 251.6634 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1500	0.0380	0.8417
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E15 Flat roof with parapet	25.8200	0.3000	7.7460
P4 Party wall - Roof (insulation at ceiling level)	5.1000	0.1010	0.5151
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9149 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.5159 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	(39)
Average = Sum(39)m / 12 =												66.5927	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	(40)
HLP (average)												1.2692	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7629 (42)
Hot water usage for mixer showers

53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day) 100.8506 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)
Energy content (annual)										Total = Sum(45)m =		1675.1071	
Distribution loss (46)m = 0.15 x (45)m	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005	(46)
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
								Total per year (kWh/year) = Sum(64)m =				1992.4381	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)

Heat gains from water heating, kWh/month

57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)
Water heating gains (Table 5)													
	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)
Total internal gains													
	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	11.2829	0.3300	0.0000	0.7700	15.5391	(81)
West	7.0700	19.6403	0.3300	0.0000	0.7700	35.2835	(80)

Solar gains	50.8226	100.6523	170.6571	259.3703	328.9733	342.1003	323.4722	270.1073	201.6427	120.5551	63.5466	41.7054	(83)
Total gains	458.4159	506.6073	563.7674	628.0933	673.9123	665.3305	633.7584	582.7767	526.5195	467.3695	437.0728	438.5997	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	
alpha	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	
util living area													
	0.9906	0.9839	0.9646	0.9090	0.7872	0.6093	0.4555	0.5129	0.7634	0.9420	0.9839	0.9923	(86)
MIT	19.6910	19.8587	20.1610	20.5328	20.8233	20.9587	20.9914	20.9853	20.8855	20.4981	20.0141	19.6402	(87)
Th 2	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	(88)
util rest of house													
	0.9875	0.9787	0.9531	0.8796	0.7256	0.5141	0.3416	0.3928	0.6750	0.9165	0.9778	0.9898	(89)
MIT 2	18.3748	18.5868	18.9647	19.4113	19.7254	19.8433	19.8626	19.8604	19.7923	19.3835	18.7860	18.3103	(90)
Living area fraction									fLA = Living area / (4) =			0.4364	(91)
MIT	18.9492	19.1419	19.4868	19.9008	20.2046	20.3301	20.3552	20.3513	20.2694	19.8699	19.3220	18.8907	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9492	19.1419	19.4868	19.9008	20.2046	20.3301	20.3552	20.3513	20.2694	19.8699	19.3220	18.8907	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9744	0.9483	0.8806	0.7455	0.5545	0.3915	0.4454	0.7091	0.9166	0.9739	0.9869	(94)
Useful gains	451.1834	493.6307	534.6088	553.1205	502.3696	368.9227	248.0969	259.5752	373.3324	428.3885	425.6556	432.8373	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	975.5302	948.4066	864.8252	732.5726	566.3416	381.5806	250.0716	263.1293	410.8372	617.3094	813.8957	978.2956	(97)
Space heating kWh													
	390.1141	305.6095	245.6810	129.2055	47.5951	0.0000	0.0000	0.0000	0.0000	140.5571	279.5328	405.8209	(98a)
Space heating requirement - total per year (kWh/year)												1944.1161	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	390.1141	305.6095	245.6810	129.2055	47.5951	0.0000	0.0000	0.0000	0.0000	140.5571	279.5328	405.8209	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1944.1161	
Space heating per m2											(98c) / (4) =	37.0520	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	390.1141	305.6095	245.6810	129.2055	47.5951	0.0000	0.0000	0.0000	0.0000	140.5571	279.5328	405.8209	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	390.1141	305.6095	245.6810	129.2055	47.5951	0.0000	0.0000	0.0000	0.0000	140.5571	279.5328	405.8209	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)

Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1944.1161	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	324.5200	
Water heating fuel used	613.9647	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)		
mechanical ventilation fans (SFP = 0.2080)	33.9527	(230a)
Total electricity for the above, kWh/year	33.9527	(231)
Electricity for lighting (calculated in Appendix L)	127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2719.3308	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1944.1161	16.4900	320.5847	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	16.4900	101.2428	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	16.4900	5.5988	(249)
Energy for lighting	127.2974	16.4900	20.9913	(250)
Additional standing charges			0.0000	(251)
Total energy cost			448.4177	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6562	(257)
SAP value		73.1529	
SAP rating (Section 12)		73	(258)
SAP band		C	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1944.1161	0.1555	302.3083	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			388.9520	(265)
Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			412.0346	(272)
CO2 emissions per m2			7.8500	(273)
EI value			94.3354	
EI rating			94	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	52.4700 (1b)	x	2.5500 (2b)	=	133.7985	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 52.4700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	133.7985	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.1500	(17)
Infiltration rate		0.1075	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0914	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.0982	0.0937	0.0937	0.0868	0.0891	0.0777	0.0777	0.0754	0.0777	0.0868	0.0845	0.0914	(22b)

Mechanical extract ventilation - centralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.0600	1.2000	2.4720			(26)
Patio Door			5.4200	1.1450	6.2061			(27)
Window			7.0700	1.1450	8.0954			(27)
Brickwork	40.4300	12.4900	27.9400	0.2100	5.8674	110.0000	3073.4000	(29a)
Communal Wall	27.2000	2.0600	25.1400	0.2100	5.2794	110.0000	2765.4001	(29a)
Lift Shaft Wall	5.9900		5.9900	0.1600	0.9584	110.0000	658.9000	(29a)
ColdRoof	52.4700		52.4700	0.0900	4.7223	9.0000	472.2300	(30)
Total net area of external elements Aum(A, m2)			126.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.6010			(33)
Main dwelling								
Party Wall 1			14.5400	0.0000	0.0000	110.0000	1599.4000	(32)
Party Floor 1			52.4700			70.0000	3672.9000	(32d)
Internal Wall 1			106.9500			9.0000	962.5500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13204.7801 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		251.6634 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	22.1500	0.0380	0.8417
E16 Corner (normal)	8.5500	0.0540	0.4617
E18 Party wall between dwellings	2.8500	0.0380	0.1083
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.1000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.2300	0.0500	0.3115
E4 Jamb	18.6000	0.0160	0.2976
E15 Flat roof with parapet	25.8200	0.3000	7.7460
P4 Party wall - Roof (insulation at ceiling level)	5.1000	0.1010	0.5151
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.7700	0.3300	1.2441
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0970	-0.6111

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.9149 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.5159 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	22.0768	(38)
Heat transfer coeff	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	66.5927	(39)
Average = Sum(39)m / 12 =												66.5927	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	1.2692	(40)
HLP (average)												1.2692	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7629	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53.7781	52.9699	51.7923	49.5390	47.8761	46.0217	44.9677	46.1365	47.4176	49.4087	51.7104	53.5721	(42a)

Hot water usage for baths

23.2496	22.9043	22.4181	21.5215	20.8502	20.1058	19.7037	20.1866	20.7123	21.5088	22.4238	23.1710	(42b)

Hot water usage for other uses

32.6842	31.4957	30.3072	29.1187	27.9301	26.7416	26.7416	27.9301	29.1187	30.3072	31.4957	32.6842	(42c)

Average daily hot water use (litres/day)	100.8506	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	109.7119	107.3699	104.5175	100.1792	96.6565	92.8692	91.4131	94.2532	97.2486	101.2247	105.6299	109.4273	(44)
Energy conte	173.7569	152.8934	160.6395	137.1403	130.1182	114.1935	110.5562	116.7051	119.9173	137.3610	150.4891	171.3367	(45)

Energy content (annual) Total = Sum(45)m = 1675.1071
Distribution loss (46)m = 0.15 x (45)m

	26.0635	22.9340	24.0959	20.5710	19.5177	17.1290	16.5834	17.5058	17.9876	20.6041	22.5734	25.7005 (46)

Water storage loss (or HIU loss):
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)

If cylinder contains dedicated solar storage

	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881 (64)

Total per year (kWh/year) = Sum(64)m = 1992.4381 (64)
Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

	57.7742	50.8370	53.4126	45.5991	43.2643	37.9693	36.7599	38.8045	39.8725	45.6725	50.0376	56.9694 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	105.7761	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.0203	16.0054	13.0165	9.8543	7.3662	6.2189	6.7197	8.7345	11.7235	14.8857	17.3738	18.5211	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	229.3203	231.6999	225.7034	212.9373	196.8225	181.6769	171.5587	169.1790	175.1756	187.9416	204.0565	219.2021	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	47.3405	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	-70.5174	(71)

Water heating gains (Table 5)

	77.6534	75.6504	71.7912	63.3321	58.1509	52.7352	49.4085	52.1565	55.3785	61.3878	69.4967	76.5718	(72)

Total internal gains

	407.5933	405.9550	393.1103	368.7231	344.9390	323.2302	310.2861	312.6694	324.8768	346.8143	373.5262	396.8943	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.4200	13.7804	0.3300	0.0000	0.7700	18.9787	(81)
West	7.0700	23.8018	0.3300	0.0000	0.7700	42.7596	(80)

Solar gains	61.7383	107.0049	180.1846	277.6073	342.3516	376.1742	352.3549	302.2168	226.8606	137.6114	76.0861	50.9254	(83)
Total gains	469.3315	512.9598	573.2949	646.3303	687.2905	699.4044	662.6410	614.8861	551.7374	484.4258	449.6123	447.8196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	55.0810	
alpha	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	4.6721	
util living area													
	0.9874	0.9795	0.9532	0.8741	0.7119	0.4856	0.3304	0.3660	0.6715	0.9137	0.9769	0.9896	(86)
MIT	19.8155	19.9726	20.2854	20.6534	20.9004	20.9867	20.9983	20.9973	20.9422	20.6220	20.1516	19.7752	(87)
Th 2	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	19.8651	(88)
util rest of house													
	0.9832	0.9726	0.9375	0.8344	0.6357	0.3842	0.2174	0.2450	0.5660	0.8760	0.9677	0.9860	(89)
MIT 2	18.5331	18.7307	19.1180	19.5477	19.7964	19.8600	19.8648	19.8647	19.8352	19.5263	18.9588	18.4823	(90)
Living area fraction									fLA = Living area / (4) =			0.4364	(91)
MIT	19.0928	19.2727	19.6275	20.0303	20.2782	20.3518	20.3595	20.3590	20.3184	20.0045	19.4794	19.0466	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0928	19.2727	19.6275	20.0303	20.2782	20.3518	20.3595	20.3590	20.3184	20.0045	19.4794	19.0466	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9681	0.9335	0.8409	0.6650	0.4284	0.2669	0.2981	0.6104	0.8814	0.9637	0.9826	(94)
Useful gains	459.6792	496.5730	535.1503	543.4713	457.0214	299.6294	176.8325	183.2726	336.7722	426.9724	433.2981	440.0177	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	931.8190	903.8447	814.2624	674.6038	491.3341	303.1140	177.1055	183.7291	354.1635	566.3369	764.4433	928.7391	(97)
Space heating kWh													
	351.2721	273.6866	207.6593	94.4154	25.5287	0.0000	0.0000	0.0000	0.0000	103.6872	238.4245	363.6088	(98a)
Space heating requirement - total per year (kWh/year)												1658.2827	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	351.2721	273.6866	207.6593	94.4154	25.5287	0.0000	0.0000	0.0000	0.0000	103.6872	238.4245	363.6088	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1658.2827	

Space heating per m2 (98c) / (4) = 31.6044 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	351.2721	273.6866	207.6593	94.4154	25.5287	0.0000	0.0000	0.0000	0.0000	103.6872	238.4245	363.6088	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	351.2721	273.6866	207.6593	94.4154	25.5287	0.0000	0.0000	0.0000	0.0000	103.6872	238.4245	363.6088	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	200.7083	177.2366	187.5909	163.2223	157.0696	140.2755	137.5076	143.6565	145.9993	164.3124	176.5711	198.2881	(64)
Efficiency of water heater												324.5200	(216)
(217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(217)
Fuel for water heating, kWh/month													
	61.8477	54.6150	57.8057	50.2965	48.4006	43.2255	42.3726	44.2674	44.9893	50.6324	54.4099	61.1020	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	2.8837	2.6046	2.8837	2.7906	2.8837	2.7906	2.8837	2.8837	2.7906	2.8837	2.7906	2.8837	(231)
Lighting	15.7730	12.6537	11.3933	8.3472	6.4476	5.2678	5.8817	7.6453	9.9305	13.0293	14.7166	16.2114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1658.2827	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												324.5200	
Water heating fuel used												613.9647	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2080)													
mechanical ventilation fans (SFP = 0.2080)												33.9527	(230a)
Total electricity for the above, kWh/year												33.9527	(231)
Electricity for lighting (calculated in Appendix L)												127.2974	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2433.4974	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1658.2827	27.6700	458.8468	(240)
Space heating - main system 2	0.0000	27.6700	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	27.6700	169.8840	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	33.9527	27.6700	9.3947	(249)
Energy for lighting	127.2974	27.6700	35.2232	(250)
Additional standing charges			0.0000	(251)
Total energy cost			673.3487	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1658.2827	0.1562	259.0621	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	613.9647	0.1411	86.6437	(264)
Space and water heating			345.7058	(265)

Pumps, fans and electric keep-hot	33.9527	0.1387	4.7097	(267)
Energy for lighting	127.2974	0.1443	18.3729	(268)
Total CO2, kg/year			368.7884	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1658.2827	1.5784	2617.3867	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	613.9647	1.5218	934.3485	(278)
Space and water heating			3551.7352	(279)
Pumps, fans and electric keep-hot	33.9527	1.5128	51.3637	(281)
Energy for lighting	127.2974	1.5338	195.2530	(282)
Total Primary energy kWh/year			3798.3519	(286)

Summary for Input Data

elmhurst energy

Plot Reference	Plot 51	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	4 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.93	**TER**	10.40
Environmental	90 B	**% DER < TER**			4.52
CO_2 Emissions (t/year)	1.13	**DFEE**	36.64	**TFEE**	37.62
Compliance Check	See BREL	**% DFEE < TFEE**			2.61
% DPER < TPER	1.30	**DPER**	53.65	**TPER**	54.36

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, Semi-Detached	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	155.25	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	19.44 m	47.23 m²	2.40 m
1st Storey:	18.60 m	43.27 m²	2.67 m
2nd Storey:	18.60 m	43.27 m²	2.67 m

8.0 Living Area 26.39 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.25	60.00	145.98	121.71	0.00	None	24.27	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	75.19	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	76.62
Internal Wall 2	Plasterboard on timber frame	9.00	86.39
Internal Wall 3	Plasterboard on timber frame	9.00	70.08

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof-600mm	External Plane Roof	Plasterboard, insulated at ceiling level	0.08	9.00	32.20	32.20	None	0.00	Enter Gross Area	0.00
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.91	3.91	None	0.00	Enter Gross Area	0.00
Sloping roof	External Slope Roof	Plasterboard, insulated slope	0.14	9.00	10.21	10.21	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.23
Internal Ceiling 2	+2	Plasterboard ceiling, carpeted chipboard floor	9.00	43.27

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground FLoor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	47.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27
Internal Floor 2	+2	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.20
Patio Door	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.51		0.72	1.20
Window-GF-FF	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Front Door	Brickwork	South East	2.15	
Patio Door	Window-GF-FF	Brickwork	North West	5.85	
NW	Window	Brickwork	North West	7.16	
SE	Window	Brickwork	South East	9.12	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	11.93	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.30	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	45.31	0.01	0.01	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.44	0.07	0.07	RCD	Yes
E6 Intermediate floor within a dwelling	Gov Approved Scheme	37.22	0.00	0.00	RCD	No
E16 Corner (normal)	Gov Approved Scheme	16.00	0.05	0.05	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	16.00	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.97	0.06	0.06	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	18.28	0.00	0.00		No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	9.97	0.04	0.04	RCD	No
E11 Eaves (insulation at rafter level)	Gov Approved Scheme	9.13	0.01	0.01	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.12	0.04	0.04	RCD	No
E15 Flat roof with parapet	Independently assessed	6.41	0.09	0.09	AbbeyCalculated	No
E13 Gable (insulation at rafter level)	Non Gov Approved Schemes	2.37	0.04	0.04	RCD	No

Y-value	0.03	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500755
Duct Type	Rigid
Wet Rooms	4

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	1
0.15	In Room Fan Other Wet Room	3
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0

0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.50	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.85	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
PD	106.00	8.00	848.00	12
DL	106.00	8.00	848.00	26

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	16636	
Fuel Type	Mains gas	
In Winter	88.30	
In Summer	87.30	
Model Name	Logic Code Combi	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	Standard Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

Summary for Input Data

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1
Ensuite 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 2	Instantaneous electric shower		9.30	No	

28.3 Waste Water Heat Recovery System
Instantaneous System 1

Database ID	80116
Brand Model	Showersave, QB1-21
Details	Year: 2017 + current Efficiency: 69.85 Utilisation factor: 0.973

29.0 Hot Water Cylinder None

32.0 Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
2.35	West	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations
Lower cost measures
None
Further measures to achieve even higher standards
None

Full SAP Calculation Printout

Plot Reference	Plot 51	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	4 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.93	**TER**	10.40
Environmental	90 B	**% DER < TER**			4.52
CO_2 Emissions (t/year)	1.13	**DFEE**	36.64	**TFEE**	37.62
Compliance Check	See BREL	**% DFEE < TFEE**			2.61
% DPER < TPER	1.30	**DPER**	53.65	**TPER**	54.36

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8500	(17)
Infiltration rate		0.1425	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1211	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1544	0.1514	0.1484	0.1332	0.1302	0.1151	0.1151	0.1120	0.1211	0.1302	0.1363	0.1423	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-600mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.5260			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0850 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 74.6110 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	(39)
Average = Sum(39)m / 12 =												131.4393	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	(40)
HLP (average)												0.9826	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---
4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
12Total per year (kWh/year)												2020	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.3949	174.2586	157.3949	162.6413	157.3949	162.6413	157.3949	157.3949	162.6413	157.3949	162.6413	157.3949	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.0364	650.5517	621.2253	599.9551	567.4578	543.4817	521.1943	521.3391	538.3035	559.8209	595.6104	618.4889	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.5100	0.7200	0.7700	85.3898	(77)
Northwest	7.1600	11.2829	0.5100	0.7200	0.7700	20.5575	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	126.1194	228.3566	348.3822	491.8945	605.9399	625.7407	593.2171	504.4370	397.4979	262.0716	153.5256	106.3377 (83)
Total gains	759.1558	878.9083	969.6076	1091.8497	1173.3978	1169.2224	1114.4114	1025.7761	935.8014	821.8925	749.1360	724.8266 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	
alpha	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	
util living area	0.9898	0.9812	0.9641	0.9151	0.8130	0.6504	0.4992	0.5566	0.7843	0.9411	0.9820	0.9915	(86)
MIT	19.2731	19.5001	19.8384	20.2927	20.6789	20.9034	20.9736	20.9597	20.7931	20.2900	19.6944	19.2182	(87)
Th 2	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	(88)
util rest of house	0.9877	0.9773	0.9564	0.8962	0.7719	0.5787	0.4050	0.4602	0.7237	0.9241	0.9775	0.9897	(89)
MIT 2	18.0615	18.3501	18.7778	19.3407	19.7939	20.0272	20.0849	20.0764	19.9273	19.3475	18.5995	17.9915	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3005	18.5769	18.9870	19.5285	19.9685	20.2001	20.2602	20.2507	20.0981	19.5334	18.8155	18.2335	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1505	18.4269	18.8370	19.3785	19.8185	20.0501	20.1102	20.1007	19.9481	19.3834	18.6655	18.0835	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9672	0.9420	0.8778	0.7575	0.5746	0.4063	0.4605	0.7122	0.9066	0.9675	0.9838	(94)
Useful gains	744.6828	850.0511	913.3754	958.4278	888.8694	671.8286	452.7897	472.3942	666.4933	745.1282	724.7760	713.0572	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1820.5005	1777.9726	1621.5731	1377.2857	1067.0893	716.3533	461.3804	486.4154	768.6726	1154.4856	1520.1662	1824.8367	(97)
Space heating kWh	800.4084	623.5632	526.8990	301.5777	132.5957	0.0000	0.0000	0.0000	0.0000	304.5619	572.6810	827.1639	(98a)
Space heating requirement - total per year (kWh/year)												4089.4507	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	800.4084	623.5632	526.8990	301.5777	132.5957	0.0000	0.0000	0.0000	0.0000	304.5619	572.6810	827.1639	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4089.4507	
Space heating per m2											(98c) / (4) =	30.5708	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	88.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	800.4084	623.5632	526.8990	301.5777	132.5957	0.0000	0.0000	0.0000	0.0000	304.5619	572.6810	827.1639	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	906.4647	706.1871	596.7147	341.5376	150.1650	0.0000	0.0000	0.0000	0.0000	344.9172	648.5628	936.7655	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0957	88.0749	88.0334	87.9435	87.7518	87.3000	87.3000	87.3000	87.3000	87.9431	88.0597	88.1028	(217)
Fuel for water heating, kWh/month	230.6615	203.3367	215.1306	187.8556	181.2977	162.9741	160.3261	167.6338	170.4392	190.0597	203.4036	228.0052	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	29.9163	23.9999	21.6093	15.8319	12.2290	9.9912	11.1557	14.5006	18.8349	24.7123	27.9125	30.7477	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.6117	-44.3054	-73.1062	-92.0863	-106.1278	-101.4771	-99.7527	-90.3226	-74.2065	-54.3255	-31.8591	-23.0679	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.6044	-23.6534	-56.8996	-100.7215	-146.6403	-152.6246	-148.6566	-117.2911	-75.1444	-36.5526	-13.4706	-7.2582	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	4631.3145	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.1239	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	241.4413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1706.7660	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5856.4479	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4631.3145	0.2100	972.5761	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.1239	0.2100	483.2360	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1455.8121	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	241.4413	0.1443	34.8474	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.2488	0.1324	-108.3302	
PV Unit electricity exported	-888.5171	0.1220	-108.4402	
Total			-216.7704	(269)
Total CO2, kg/year			1327.9852	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.9300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4631.3145	1.1300	5233.3854	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.1239	1.1300	2600.2700	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7833.6554	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	241.4413	1.5338	370.3308	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.2488	1.4892	-1218.5209	
PV Unit electricity exported	-888.5171	0.4478	-397.8829	
Total			-1616.4037	(283)
Total Primary energy kWh/year			7176.9068	(286)
Dwelling Primary energy Rate (DPER)			53.6500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.1161	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000	(17)
Infiltration rate												0.3661	(18)
Number of sides sheltered												2	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-600mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	155.2498	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E13 Gable (insulation at rafter level)	2.3700	0.0800	0.1896

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9543	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	75.5851	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff													
	141.3612	141.0137	140.6731	139.0735	138.7742	137.3809	137.3809	137.1229	137.9176	138.7742	139.3796	140.0126	(39)
Average = Sum(39)m / 12 =												139.0720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0567	1.0542	1.0516	1.0396	1.0374	1.0270	1.0270	1.0251	1.0310	1.0374	1.0419	1.0467	(40)
HLP (average)												1.0396	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m													
	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8091	40.9097	41.0087	41.4804	41.5699	41.9914	41.9914	42.0704	41.8280	41.5699	41.3893	41.2022	
alpha	3.7206	3.7273	3.7339	3.7654	3.7713	3.7994	3.7994	3.8047	3.7885	3.7713	3.7593	3.7468	
util living area													
	0.9882	0.9781	0.9583	0.9032	0.7943	0.6271	0.4794	0.5356	0.7661	0.9332	0.9792	0.9901	(86)
MIT	19.1583	19.4097	19.7786	20.2761	20.6752	20.9054	20.9737	20.9604	20.7920	20.2672	19.6327	19.1211	(87)
Th 2	20.0363	20.0385	20.0406	20.0504	20.0523	20.0609	20.0609	20.0625	20.0576	20.0523	20.0485	20.0446	(88)
util rest of house													
	0.9857	0.9735	0.9493	0.8820	0.7503	0.5536	0.3847	0.4382	0.7020	0.9141	0.9741	0.9880	(89)
MIT 2	17.8751	18.1955	18.6624	19.2832	19.7492	19.9931	20.0483	20.0419	19.8892	19.2854	18.4882	17.8331	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.1282	18.4351	18.8826	19.4791	19.9319	20.1730	20.2309	20.2231	20.0673	19.4790	18.7140	18.0872	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1282	18.4351	18.8826	19.4791	19.9319	20.1730	20.2309	20.2231	20.0673	19.4790	18.7140	18.0872	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9630	0.9352	0.8667	0.7440	0.5629	0.4024	0.4556	0.7027	0.8995	0.9640	0.9816	(94)
Useful gains	782.3688	900.9071	975.3824	1025.0915	950.7362	717.3399	488.6736	508.0803	711.2742	791.7609	763.8501	747.7862	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1954.7733	1908.6277	1741.9039	1471.2725	1142.3717	765.6299	498.8145	524.2350	822.9960	1232.1826	1618.7494	1944.3844	(97)
Space heating kWh													
	872.2690	677.1882	570.2920	321.2503	142.5768	0.0000	0.0000	0.0000	0.0000	327.6738	615.5275	890.2691	(98a)
Space heating requirement - total per year (kWh/year)												4417.0467	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	872.2690	677.1882	570.2920	321.2503	142.5768	0.0000	0.0000	0.0000	0.0000	327.6738	615.5275	890.2691	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4417.0467	
Space heating per m2											(98c) / (4) =	33.0197	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	872.2690	677.1882	570.2920	321.2503	142.5768	0.0000	0.0000	0.0000	0.0000	327.6738	615.5275	890.2691	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	944.0140	732.8877	617.1992	347.6735	154.3039	0.0000	0.0000	0.0000	0.0000	354.6253	666.1553	963.4947	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652 (64)

Efficiency of water heater 80.3000 (216)

(217)m	86.8082	86.5959	86.1830	85.2922	83.6325	80.3000	80.3000	80.3000	80.3000	85.3074	86.4208	86.8569 (217)

Fuel for water heating, kWh/month

	291.7111	258.5107	276.0442	245.8663	243.4052	228.8498	226.3471	235.2227	237.6393	248.9209	260.5866	288.4804 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4780.3536 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	3041.5844 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	264.9585 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2334.4611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5838.4354 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4780.3536	0.2100	1003.8743	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3041.5844	0.2100	638.7327	(264)
Space and water heating			1642.6070	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1390.6099	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4780.3536	1.1300	5401.7996	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3041.5844	1.1300	3436.9904	(278)
Space and water heating			8838.7899	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			7271.6186	(286)
Target Primary Energy Rate (TPER)			54.3600	(287)

Full SAP Calculation Printout

Plot Reference	Plot 51	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	4 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.93	**TER**	10.40
Environmental	90 B	**% DER < TER**			4.52
CO_2 Emissions (t/year)	1.13	**DFEE**	36.64	**TFEE**	37.62
Compliance Check	See BREL	**% DFEE < TFEE**			2.61
% DPER < TPER	1.30	**DPER**	53.65	**TPER**	54.36

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8500	(17)
Infiltration rate		0.2586	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2198	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2803	0.2748	0.2693	0.2418	0.2363	0.2089	0.2089	0.2034	0.2198	0.2363	0.2473	0.2583	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5393	0.5378	0.5363	0.5292	0.5279	0.5218	0.5218	0.5207	0.5242	0.5279	0.5306	0.5334	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-600mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.5260			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)

Internal Floor 2	43.2700	18.0000	778.8600	(32d)
Internal Ceiling 1	47.2300	9.0000	425.0700	(32e)
Internal Ceiling 2	43.2700	9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0850 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 74.6110 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.2932	61.1198	60.9499	60.1516	60.0023	59.3071	59.3071	59.1783	59.5749	60.0023	60.3044	60.6203	(38)
Heat transfer coeff	135.9042	135.7308	135.5609	134.7627	134.6133	133.9181	133.9181	133.7894	134.1859	134.6133	134.9155	135.2313	(39)

Average = Sum(39)m / 12 = 134.7620

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0160	1.0147	1.0134	1.0074	1.0063	1.0011	1.0011	1.0001	1.0031	1.0063	1.0086	1.0109	(40)
HLP (average)												1.0074	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)

Energy content (annual) Total = Sum(45)m = 1154.6247
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)

Total per year (kWh/year) = Sum(64)m = 981.4310 (64)
12Total per year (kWh/year) 981 (64)
Electric shower(s)

58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 664.1943 (64a)
Heat gains from water heating, kWh/month

40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.3949	174.2586	157.3949	162.6413	157.3949	162.6413	157.3949	157.3949	162.6413	157.3949	162.6413	157.3949	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains	580.0974	598.7388	571.8755	556.3915	527.3315	509.9736	490.0945	488.5437	503.4753	517.9590	548.2187	566.3257	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

		m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Southeast		9.1200	36.7938	0.5100	0.7200	0.7700	85.3898	(77)
Northwest		7.1600	11.2829	0.5100	0.7200	0.7700	20.5575	(81)
Northwest		5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	126.1194	228.3566	348.3822	491.8945	605.9399	625.7407	593.2171	504.4370	397.4979	262.0716	153.5256	106.3377	(83)
Total gains	706.2168	827.0954	920.2577	1048.2860	1133.2715	1135.7142	1083.3116	992.9808	900.9732	780.0307	701.7443	672.6634	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.4477	42.5019	42.5552	42.8073	42.8548	43.0772	43.0772	43.1187	42.9913	42.8548	42.7588	42.6589	
alpha	3.8298	3.8335	3.8370	3.8538	3.8570	3.8718	3.8718	3.8746	3.8661	3.8570	3.8506	3.8439	
util living area	0.9921	0.9849	0.9703	0.9263	0.8317	0.6712	0.5192	0.5789	0.8052	0.9507	0.9857	0.9934	(86)
MIT	19.1400	19.3745	19.7275	20.2162	20.6322	20.8872	20.9681	20.9517	20.7616	20.2175	19.5940	19.0963	(87)
Th 2	20.0701	20.0711	20.0722	20.0772	20.0781	20.0824	20.0824	20.0832	20.0807	20.0781	20.0762	20.0742	(88)
util rest of house	0.9904	0.9816	0.9637	0.9092	0.7922	0.5985	0.4210	0.4791	0.7462	0.9359	0.9821	0.9920	(89)
MIT 2	18.3585	18.5920	18.9416	19.4198	19.8047	20.0176	20.0701	20.0630	19.9258	19.4293	18.8153	18.3181	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.5127	18.7464	19.0967	19.5769	19.9679	20.1892	20.2473	20.2383	20.0907	19.5848	18.9689	18.4716	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5127	18.7464	19.0967	19.5769	19.9679	20.1892	20.2473	20.2383	20.0907	19.5848	18.9689	18.4716	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9864	0.9755	0.9547	0.8980	0.7869	0.6076	0.4393	0.4969	0.7469	0.9258	0.9761	0.9886	(94)
Useful gains	696.6418	806.7951	878.5775	941.3204	891.7414	690.0360	475.9006	493.4518	672.9669	722.1339	684.9907	664.9939	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1931.5607	1879.3787	1707.6156	1438.8524	1112.9729	748.4909	488.4346	513.5230	803.8685	1209.4695	1601.2960	1929.9673	(97)
Space heating kWh	918.7796	720.7762	616.8043	358.2230	164.5962	0.0000	0.0000	0.0000	0.0000	362.5777	659.7399	941.1402	(98a)
Space heating requirement - total per year (kWh/year)												4742.6371	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	918.7796	720.7762	616.8043	358.2230	164.5962	0.0000	0.0000	0.0000	0.0000	362.5777	659.7399	941.1402	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4742.6371	
Space heating per m2										(98c) / (4) =		35.4537	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1258.8302	990.9940	1016.7991	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7942	0.8629	0.8238	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	999.8164	855.0901	837.6340	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1257.2631	1199.1575	1096.7549	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	185.3617	255.9861	192.7860	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.3404	63.9965	48.1965	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												158.5334	(107)
Energy for space heating												35.4537	(99)
Energy for space cooling												1.1851	(108)
Total												36.6388	(109)
Fabric Energy Efficiency (DFEE)												36.6	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-600mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E13 Gable (insulation at rafter level)	2.3700	0.0800	0.1896

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9543	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	75.5851	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	141.3612	141.0137	140.6731	139.0735	138.7742	137.3809	137.3809	137.1229	137.9176	138.7742	139.3796	140.0126	(39)
Average = Sum(39)m / 12 =												139.0720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0567	1.0542	1.0516	1.0396	1.0374	1.0270	1.0270	1.0251	1.0310	1.0374	1.0419	1.0467	(40)
HLP (average)												1.0396	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
										Total per year (kWh/year) = Sum(64)m =		981.4310	(64)
12Total per year (kWh/year)												981	(64)
Electric shower(s)													
	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				664.1943	(64a)
Heat gains from water heating, kWh/month													
	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains													
	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8091	40.9097	41.0087	41.4804	41.5699	41.9914	41.9914	42.0704	41.8280	41.5699	41.3893	41.2022	
alpha	3.7206	3.7273	3.7339	3.7654	3.7713	3.7994	3.7994	3.8047	3.7885	3.7713	3.7593	3.7468	
util living area													
	0.9913	0.9828	0.9657	0.9150	0.8112	0.6448	0.4953	0.5548	0.7863	0.9445	0.9841	0.9928	(86)
MIT	19.0782	19.3340	19.7116	20.2286	20.6480	20.8960	20.9707	20.9554	20.7708	20.2153	19.5628	19.0414	(87)
Th 2	20.0363	20.0385	20.0406	20.0504	20.0523	20.0609	20.0609	20.0625	20.0576	20.0523	20.0485	20.0446	(88)
util rest of house													
	0.9894	0.9792	0.9581	0.8957	0.7687	0.5709	0.3983	0.4554	0.7241	0.9279	0.9801	0.9912	(89)
MIT 2	18.2726	18.5279	18.9019	19.4090	19.7941	20.0022	20.0499	20.0442	19.9111	19.4066	18.7640	18.2420	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.4315	18.6869	19.0617	19.5707	19.9626	20.1785	20.2315	20.2240	20.0807	19.5661	18.9216	18.3997	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4315	18.6869	19.0617	19.5707	19.9626	20.1785	20.2315	20.2240	20.0807	19.5661	18.9216	18.3997	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9722	0.9481	0.8841	0.7643	0.5808	0.4165	0.4734	0.7258	0.9172	0.9736	0.9875	(94)
Useful gains	717.1991	841.3799	925.3445	993.1097	934.5712	712.6627	487.4996	505.9754	699.2612	755.0643	708.8702	682.6616	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1997.6481	1944.1424	1767.0885	1484.0073	1146.6310	766.3860	498.9028	524.3547	824.8448	1244.2643	1647.6866	1988.1360	(97)
Space heating kWh													
	952.6540	741.0564	626.2575	353.4463	157.7724	0.0000	0.0000	0.0000	0.0000	363.9648	675.9478	971.2729	(98a)
Space heating requirement - total per year (kWh/year)												4842.3723	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	952.6540	741.0564	626.2575	353.4463	157.7724	0.0000	0.0000	0.0000	0.0000	363.9648	675.9478	971.2729	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4842.3723	
Space heating per m2											(98c) / (4) =	36.1992	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Full SAP Calculation Printout

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1291.3807	1016.6189	1042.1342	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8126	0.8764	0.8394	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1049.3280	891.0026	874.7638	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	226.1395	304.5231	230.6863	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	56.5349	76.1308	57.6716	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												190.3372	(107)
Energy for space heating												36.1992	(99)
Energy for space cooling												1.4229	(108)
Total												37.6221	(109)
Fabric Energy Efficiency (TFEE)												37.6	(109)

Full SAP Calculation Printout

Plot Reference	Plot 51	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	4 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.93	**TER**	10.40
Environmental	90 B	**% DER < TER**			4.52
CO_2 Emissions (t/year)	1.13	**DFEE**	36.64	**TFEE**	37.62
Compliance Check	See BREL	**% DFEE < TFEE**			2.61
% DPER < TPER	1.30	**DPER**	53.65	**TPER**	54.36

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8500	(17)
Infiltration rate		0.1425	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1211	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1544	0.1514	0.1484	0.1332	0.1302	0.1151	0.1151	0.1120	0.1211	0.1302	0.1363	0.1423	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-600mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.5260			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0850 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 74.6110 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	(39)
Average = Sum(39)m / 12 =												131.4393	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	(40)
HLP (average)												0.9826	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
12Total per year (kWh/year)												2020	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.3949	174.2586	157.3949	162.6413	157.3949	162.6413	157.3949	157.3949	162.6413	157.3949	162.6413	157.3949	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.0364	650.5517	621.2253	599.9551	567.4578	543.4817	521.1943	521.3391	538.3035	559.8209	595.6104	618.4889	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.5100	0.7200	0.7700	85.3898	(77)
Northwest	7.1600	11.2829	0.5100	0.7200	0.7700	20.5575	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	126.1194	228.3566	348.3822	491.8945	605.9399	625.7407	593.2171	504.4370	397.4979	262.0716	153.5256	106.3377 (83)
Total gains	759.1558	878.9083	969.6076	1091.8497	1173.3978	1169.2224	1114.4114	1025.7761	935.8014	821.8925	749.1360	724.8266 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	
alpha	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	
util living area	0.9898	0.9812	0.9641	0.9151	0.8130	0.6504	0.4992	0.5566	0.7843	0.9411	0.9820	0.9915	(86)
MIT	19.2731	19.5001	19.8384	20.2927	20.6789	20.9034	20.9736	20.9597	20.7931	20.2900	19.6944	19.2182	(87)
Th 2	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	(88)
util rest of house	0.9877	0.9773	0.9564	0.8962	0.7719	0.5787	0.4050	0.4602	0.7237	0.9241	0.9775	0.9897	(89)
MIT 2	18.0615	18.3501	18.7778	19.3407	19.7939	20.0272	20.0849	20.0764	19.9273	19.3475	18.5995	17.9915	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3005	18.5769	18.9870	19.5285	19.9685	20.2001	20.2602	20.2507	20.0981	19.5334	18.8155	18.2335	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1505	18.4269	18.8370	19.3785	19.8185	20.0501	20.1102	20.1007	19.9481	19.3834	18.6655	18.0835	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9672	0.9420	0.8778	0.7575	0.5746	0.4063	0.4605	0.7122	0.9066	0.9675	0.9838	(94)
Useful gains	744.6828	850.0511	913.3754	958.4278	888.8694	671.8286	452.7897	472.3942	666.4933	745.1282	724.7760	713.0572	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1820.5005	1777.9726	1621.5731	1377.2857	1067.0893	716.3533	461.3804	486.4154	768.6726	1154.4856	1520.1662	1824.8367	(97)
Space heating kWh	800.4084	623.5632	526.8990	301.5777	132.5957	0.0000	0.0000	0.0000	0.0000	304.5619	572.6810	827.1639	(98a)
Space heating requirement - total per year (kWh/year)												4089.4507	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	800.4084	623.5632	526.8990	301.5777	132.5957	0.0000	0.0000	0.0000	0.0000	304.5619	572.6810	827.1639	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4089.4507	
Space heating per m2											(98c) / (4) =	30.5708	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	88.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	800.4084	623.5632	526.8990	301.5777	132.5957	0.0000	0.0000	0.0000	0.0000	304.5619	572.6810	827.1639	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	906.4647	706.1871	596.7147	341.5376	150.1650	0.0000	0.0000	0.0000	0.0000	344.9172	648.5628	936.7655	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0957	88.0749	88.0334	87.9435	87.7518	87.3000	87.3000	87.3000	87.3000	87.9431	88.0597	88.1028	(217)
Fuel for water heating, kWh/month	230.6615	203.3367	215.1306	187.8556	181.2977	162.9741	160.3261	167.6338	170.4392	190.0597	203.4036	228.0052	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	29.9163	23.9999	21.6093	15.8319	12.2290	9.9912	11.1557	14.5006	18.8349	24.7123	27.9125	30.7477	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.6117	-44.3054	-73.1062	-92.0863	-106.1278	-101.4771	-99.7527	-90.3226	-74.2065	-54.3255	-31.8591	-23.0679	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.6044	-23.6534	-56.8996	-100.7215	-146.6403	-152.6246	-148.6566	-117.2911	-75.1444	-36.5526	-13.4706	-7.2582	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	4631.3145	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.1239	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	241.4413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1706.7660	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5856.4479	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4631.3145	0.2100	972.5761	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.1239	0.2100	483.2360	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1455.8121	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	241.4413	0.1443	34.8474	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.2488	0.1324	-108.3302	
PV Unit electricity exported	-888.5171	0.1220	-108.4402	
Total			-216.7704	(269)
Total CO2, kg/year			1327.9852	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.9300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4631.3145	1.1300	5233.3854	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.1239	1.1300	2600.2700	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7833.6554	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	241.4413	1.5338	370.3308	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.2488	1.4892	-1218.5209	
PV Unit electricity exported	-888.5171	0.4478	-397.8829	
Total			-1616.4037	(283)
Total Primary energy kWh/year			7176.9068	(286)
Dwelling Primary energy Rate (DPER)			53.6500	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.1161	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000	(17)
Infiltration rate												0.3661	(18)
Number of sides sheltered												2	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-600mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	155.2498	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E13 Gable (insulation at rafter level)	2.3700	0.0800	0.1896

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9543	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	75.5851	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff													
	141.3612	141.0137	140.6731	139.0735	138.7742	137.3809	137.3809	137.1229	137.9176	138.7742	139.3796	140.0126	(39)
Average = Sum(39)m / 12 =												139.0720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0567	1.0542	1.0516	1.0396	1.0374	1.0270	1.0270	1.0251	1.0310	1.0374	1.0419	1.0467	(40)
HLP (average)												1.0396	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m													
	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8091	40.9097	41.0087	41.4804	41.5699	41.9914	41.9914	42.0704	41.8280	41.5699	41.3893	41.2022	
alpha	3.7206	3.7273	3.7339	3.7654	3.7713	3.7994	3.7994	3.8047	3.7885	3.7713	3.7593	3.7468	
util living area													
	0.9882	0.9781	0.9583	0.9032	0.7943	0.6271	0.4794	0.5356	0.7661	0.9332	0.9792	0.9901	(86)
MIT	19.1583	19.4097	19.7786	20.2761	20.6752	20.9054	20.9737	20.9604	20.7920	20.2672	19.6327	19.1211	(87)
Th 2	20.0363	20.0385	20.0406	20.0504	20.0523	20.0609	20.0609	20.0625	20.0576	20.0523	20.0485	20.0446	(88)
util rest of house													
	0.9857	0.9735	0.9493	0.8820	0.7503	0.5536	0.3847	0.4382	0.7020	0.9141	0.9741	0.9880	(89)
MIT 2	17.8751	18.1955	18.6624	19.2832	19.7492	19.9931	20.0483	20.0419	19.8892	19.2854	18.4882	17.8331	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.1282	18.4351	18.8826	19.4791	19.9319	20.1730	20.2309	20.2231	20.0673	19.4790	18.7140	18.0872	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1282	18.4351	18.8826	19.4791	19.9319	20.1730	20.2309	20.2231	20.0673	19.4790	18.7140	18.0872	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9630	0.9352	0.8667	0.7440	0.5629	0.4024	0.4556	0.7027	0.8995	0.9640	0.9816	(94)
Useful gains	782.3688	900.9071	975.3824	1025.0915	950.7362	717.3399	488.6736	508.0803	711.2742	791.7609	763.8501	747.7862	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1954.7733	1908.6277	1741.9039	1471.2725	1142.3717	765.6299	498.8145	524.2350	822.9960	1232.1826	1618.7494	1944.3844	(97)
Space heating kWh													
	872.2690	677.1882	570.2920	321.2503	142.5768	0.0000	0.0000	0.0000	0.0000	327.6738	615.5275	890.2691	(98a)
Space heating requirement - total per year (kWh/year)												4417.0467	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	872.2690	677.1882	570.2920	321.2503	142.5768	0.0000	0.0000	0.0000	0.0000	327.6738	615.5275	890.2691	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4417.0467	
Space heating per m2											(98c) / (4) =	33.0197	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	872.2690	677.1882	570.2920	321.2503	142.5768	0.0000	0.0000	0.0000	0.0000	327.6738	615.5275	890.2691	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	944.0140	732.8877	617.1992	347.6735	154.3039	0.0000	0.0000	0.0000	0.0000	354.6253	666.1553	963.4947	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652 (64)

Efficiency of water heater 80.3000 (216)

(217)m	86.8082	86.5959	86.1830	85.2922	83.6325	80.3000	80.3000	80.3000	80.3000	85.3074	86.4208	86.8569 (217)

Fuel for water heating, kWh/month

	291.7111	258.5107	276.0442	245.8663	243.4052	228.8498	226.3471	235.2227	237.6393	248.9209	260.5866	288.4804 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4780.3536 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	3041.5844 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	264.9585 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2334.4611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5838.4354 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4780.3536	0.2100	1003.8743	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3041.5844	0.2100	638.7327	(264)
Space and water heating			1642.6070	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1390.6099	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4780.3536	1.1300	5401.7996	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3041.5844	1.1300	3436.9904	(278)
Space and water heating			8838.7899	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			7271.6186	(286)
Target Primary Energy Rate (TPER)			54.3600	(287)

Full SAP Calculation Printout

Plot Reference	Plot 51	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	4 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.93	**TER**	10.40
Environmental	90 B	**% DER < TER**			4.52
CO_2 Emissions (t/year)	1.13	**DFEE**	36.64	**TFEE**	37.62
Compliance Check	See BREL	**% DFEE < TFEE**			2.61
% DPER < TPER	1.30	**DPER**	53.65	**TPER**	54.36

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8500	(17)
Infiltration rate		0.1425	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1211	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1544	0.1514	0.1484	0.1332	0.1302	0.1151	0.1151	0.1120	0.1211	0.1302	0.1363	0.1423	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-600mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.5260			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0850 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 74.6110 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	(39)
Average = Sum(39)m / 12 =												131.4393	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	(40)
HLP (average)												0.9826	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.1785	30.3571	24.6880	18.6904	13.9713	11.7952	12.7451	16.5666	22.2356	28.2332	32.9523	35.1284	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	705.5192	703.8939	681.8699	641.0693	598.6394	557.4098	534.7512	537.1728	558.4521	599.4999	645.2220	685.3540	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.5100	0.7200	0.7700	85.3898	(77)
Northwest	7.1600	11.2829	0.5100	0.7200	0.7700	20.5575	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	126.1194	228.3566	348.3822	491.8945	605.9399	625.7407	593.2171	504.4370	397.4979	262.0716	153.5256	106.3377	(83)
Total gains	831.6386	932.2505	1030.2521	1132.9638	1204.5794	1183.1505	1127.9683	1041.6099	955.9500	861.5715	798.7476	791.6917	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	
alpha	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	
util living area	0.9861	0.9772	0.9569	0.9064	0.8028	0.6448	0.4939	0.5496	0.7755	0.9327	0.9778	0.9885	(86)
MIT	19.3552	19.5583	19.8994	20.3260	20.6945	20.9063	20.9746	20.9615	20.8019	20.3261	19.7487	19.2946	(87)
Th 2	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	(88)
util rest of house	0.9833	0.9726	0.9478	0.8862	0.7608	0.5731	0.4004	0.4538	0.7140	0.9139	0.9724	0.9861	(89)
MIT 2	18.1658	18.4233	18.8533	19.3799	19.8103	20.0295	20.0854	20.0774	19.9355	19.3902	18.6677	18.0887	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.4004	18.6472	19.0597	19.5665	19.9847	20.2025	20.2608	20.2518	20.1064	19.5748	18.8810	18.3266	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2504	18.4972	18.9097	19.4165	19.8347	20.0525	20.1108	20.1018	19.9564	19.4248	18.7310	18.1766	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9750	0.9613	0.9323	0.8677	0.7470	0.5693	0.4018	0.4543	0.7031	0.8959	0.9611	0.9788	(94)
Useful gains	810.8261	896.1414	960.5038	983.1191	899.7900	673.5462	453.1970	473.1916	672.1248	771.8820	767.6547	774.8879	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1833.6338	1787.2132	1631.1194	1382.2821	1069.2199	716.6740	461.4587	486.5677	769.7658	1159.9316	1528.7663	1837.0775	(97)
Space heating kWh	760.9689	598.8003	498.9380	287.3973	126.0558	0.0000	0.0000	0.0000	0.0000	288.7089	548.0003	790.2691	(98a)
Space heating requirement - total per year (kWh/year)												3899.1386	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	760.9689	598.8003	498.9380	287.3973	126.0558	0.0000	0.0000	0.0000	0.0000	288.7089	548.0003	790.2691	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3899.1386	
Space heating per m2											(98c) / (4) =	29.1481	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												88.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	760.9689	598.8003	498.9380	287.3973	126.0558	0.0000	0.0000	0.0000	0.0000	288.7089	548.0003	790.2691	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	861.7995	678.1430	565.0487	325.4783	142.7586	0.0000	0.0000	0.0000	0.0000	326.9636	620.6119	894.9819	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0873	88.0678	88.0226	87.9323	87.7393	87.3000	87.3000	87.3000	87.3000	87.9307	88.0515	88.0955	(217)
Fuel for water heating, kWh/month	230.6834	203.3532	215.1570	187.8794	181.3235	162.9741	160.3261	167.6338	170.4392	190.0865	203.4224	228.0242	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	29.9163	23.9999	21.6093	15.8319	12.2290	9.9912	11.1557	14.5006	18.8349	24.7123	27.9125	30.7477	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.6117	-44.3054	-73.1062	-92.0863	-106.1278	-101.4771	-99.7527	-90.3226	-74.2065	-54.3255	-31.8591	-23.0679	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.6044	-23.6534	-56.8996	-100.7215	-146.6403	-152.6246	-148.6566	-117.2911	-75.1444	-36.5526	-13.4706	-7.2582	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4415.7855	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.3026	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	241.4413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1706.7660	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5641.0977	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4415.7855	3.6400	160.7346	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.3026	3.6400	83.7674	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	241.4413	16.4900	39.8137	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.2488	16.4900	-134.9292	
PV Unit electricity exported	-888.5171	5.5900	-49.6681	
Total			-184.5973	(252)
Total energy cost			255.9195	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5154	(257)
SAP value		91.6460	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4415.7855	0.2100	927.3150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.3026	0.2100	483.2736	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1410.5885	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	241.4413	0.1443	34.8474	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.2488	0.1324	-108.3302	
PV Unit electricity exported	-888.5171	0.1220	-108.4402	
Total			-216.7704	(269)
Total CO2, kg/year			1282.7617	(272)
CO2 emissions per m2			9.5900	(273)
EI value			90.3848	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8500	(17)
Infiltration rate		0.1425	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1211	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1302	0.1242	0.1242	0.1151	0.1181	0.1030	0.1030	0.0999	0.1030	0.1151	0.1120	0.1211	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-600mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.5260			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0850 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	74.6110 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	(39)
Average = Sum(39)m / 12 =												131.4393	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	(40)
HLP (average)												0.9826	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.1785	30.3571	24.6880	18.6904	13.9713	11.7952	12.7451	16.5666	22.2356	28.2332	32.9523	35.1284	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	705.5192	703.8939	681.8699	641.0693	598.6394	557.4098	534.7512	537.1728	558.4521	599.4999	645.2220	685.3540	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	43.0593	0.5100	0.7200	0.7700	99.9304	(77)
Northwest	7.1600	13.7804	0.5100	0.7200	0.7700	25.1080	(81)
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	149.6754	237.6611	362.0994	522.0527	628.2426	686.6559	644.4209	560.9048	441.5365	293.3716	179.6568	126.8201	(83)
Total gains	855.1947	941.5550	1043.9693	1163.1220	1226.8820	1244.0657	1179.1721	1098.0777	999.9886	892.8715	824.8788	812.1741	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	
alpha	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	
util living area	0.9821	0.9723	0.9458	0.8761	0.7370	0.5245	0.3632	0.3998	0.6935	0.9055	0.9695	0.9849	(86)
MIT	19.5047	19.6895	20.0428	20.4738	20.8080	20.9630	20.9935	20.9906	20.8862	20.4735	19.9126	19.4569	(87)
Th 2	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	(88)
util rest of house	0.9783	0.9665	0.9341	0.8493	0.6830	0.4427	0.2662	0.2972	0.6167	0.8788	0.9619	0.9817	(89)
MIT 2	18.3562	18.5898	19.0329	19.5567	19.9319	20.0761	20.0959	20.0948	20.0160	19.5676	18.8750	18.2958	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.5827	18.8068	19.2321	19.7376	20.1048	20.2511	20.2730	20.2715	20.1877	19.7463	19.0797	18.5248	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4327	18.6568	19.0821	19.5876	19.9548	20.1011	20.1230	20.1215	20.0377	19.5963	18.9297	18.3748	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9685	0.9539	0.9172	0.8314	0.6736	0.4430	0.2689	0.2999	0.6111	0.8604	0.9484	0.9728	(94)
Useful gains	828.2208	898.1118	957.5779	967.0067	826.4533	551.0930	317.1072	329.3210	611.1142	768.1948	782.3315	790.0969	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1752.4465	1703.0295	1535.4880	1273.3317	927.2755	565.3281	318.4720	331.4251	662.1489	1064.1741	1436.5904	1744.8330	(97)
Space heating kWh	687.6240	540.9046	429.9651	220.5539	75.0117	0.0000	0.0000	0.0000	0.0000	220.2086	471.0664	710.3237	(98a)
Space heating requirement - total per year (kWh/year)												3355.6580	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													

	687.6240	540.9046	429.9651	220.5539	75.0117	0.0000	0.0000	0.0000	0.0000	220.2086	471.0664	710.3237 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3355.6580
Space heating per m2											(98c) / (4) =	25.0853 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													88.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	687.6240	540.9046	429.9651	220.5539	75.0117	0.0000	0.0000	0.0000	0.0000	220.2086	471.0664	710.3237	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	778.7361	612.5760	486.9367	249.7780	84.9510	0.0000	0.0000	0.0000	0.0000	249.3868	533.4840	804.4436	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater													87.3000 (216)
(217)m	88.0699	88.0491	87.9918	87.8689	87.6179	87.3000	87.3000	87.3000	87.3000	87.8657	88.0222	88.0776	(217)
Fuel for water heating, kWh/month													
	230.7291	203.3962	215.2322	188.0149	181.5746	162.9741	160.3261	167.6338	170.4392	190.2271	203.4902	228.0705	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	29.9163	23.9999	21.6093	15.8319	12.2290	9.9912	11.1557	14.5006	18.8349	24.7123	27.9125	30.7477	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.6674	-46.6208	-76.0647	-96.0465	-108.4633	-106.5709	-104.2890	-96.2109	-80.0108	-59.9702	-37.0293	-27.4937	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.8025	-25.9384	-61.5045	-110.4082	-154.4710	-172.6541	-166.1450	-136.0830	-88.2576	-44.1303	-17.5360	-9.7644	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													3800.2921 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													87.3000
Water heating fuel used													2302.1079 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)													
mechanical ventilation fans (SFP = 0.1950)													81.9360 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													167.9360 (231)
Electricity for lighting (calculated in Appendix L)													241.4413 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1871.1326 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													4862.0430 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3800.2921	7.3200	278.1814	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.1079	7.3200	168.5143	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	241.4413	27.6700	66.8068	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4376	27.6700	-241.1268	
PV Unit electricity exported	-999.6950	5.8100	-58.0823	
Total			-299.2091	(252)
Total energy cost			430.0222	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3800.2921	0.2100	798.0613	(261)

Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.1079	0.2100	483.4427	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1281.5040	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	241.4413	0.1443	34.8474	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4376	0.1327	-115.6042	
PV Unit electricity exported	-999.6950	0.1220	-121.9480	
Total			-237.5522	(269)
Total CO2, kg/year			1132.8955	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3800.2921	1.1300	4294.3301	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.1079	1.1300	2601.3820	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6895.7121	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	241.4413	1.5338	370.3308	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4376	1.4902	-1298.5903	
PV Unit electricity exported	-999.6950	0.4475	-447.3750	
Total			-1745.9653	(283)
Total Primary energy kWh/year			6109.4019	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: A 92
Current environmental impact rating: B 90

N	Solar water heating	SAP increase too small
U	Solar photovoltaic panels	Already installed
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.4	-£ 34	-146 kg (12.9%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 92
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£175	£175	£0
Mains gas	£555	£555	£0
Space heating	£433	£433	£0
Water heating	£230	£230	£0
Lighting	£67	£67	£0
Generated (PV)	-£299	-£299	£0
Total cost of fuels	£431	£431	£0
Total cost of uses	£431	£431	£0
Delivered energy	36 kWh/m²	36 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	46 kWh/m²	46 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)

Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 344.4138 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8500	(17)
Infiltration rate		0.1425	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1211	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1544	0.1514	0.1484	0.1332	0.1302	0.1151	0.1151	0.1120	0.1211	0.1302	0.1363	0.1423	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26a)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-600mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.5260			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0850 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	74.6110 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	(39)
Average = Sum(39)m / 12 =												131.4393	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	(40)
HLP (average)												0.9826	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.9041 (42)

Hot water usage for mixer showers
48.6085 47.8780 46.8136 44.7769 43.2739 41.5977 40.6450 41.7014 42.8595 44.6591 46.7396 48.4223 (42a)
Hot water usage for baths
31.4781 31.0106 30.3523 29.1384 28.2295 27.2217 26.6773 27.3310 28.0428 29.1212 30.3601 31.3717 (42b)
Hot water usage for other uses
44.3714 42.7578 41.1443 39.5308 37.9173 36.3038 36.3038 37.9173 39.5308 41.1443 42.7578 44.3714 (42c)
Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892
Distribution loss (46)m = 0.15 x (45)m
29.5667 25.9835 27.2758 23.2953 22.0952 19.3892 18.7990 19.8639 20.4263 23.3928 25.6138 29.1619 (46)
Water storage loss (or HIU loss):
Total storage loss
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
If cylinder contains dedicated solar storage
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Total heat required for water heating calculated for each month
224.6071 198.0187 209.2092 181.6205 174.3890 155.3662 152.2343 159.3918 162.3366 183.1103 197.2041 221.8868 (62)

WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h
203.2029 179.0886 189.3867 165.2067 159.0919 142.2764 139.9647 146.3443 148.7934 167.1443 179.1166 200.8790 (64)
Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)
Electric shower(s)
19.4637 17.3423 18.9371 18.0715 18.4106 17.5619 18.1473 18.4106 18.0715 18.9371 18.5810 19.4637 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month
77.2794 68.1311 72.0382 62.7354 60.3523 53.8961 52.9349 55.3758 56.3365 63.3779 68.0339 76.3767 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
34.1785 30.3571 24.6880 18.6904 13.9713 11.7952 12.7451 16.5666 22.2356 28.2332 32.9523 35.1284 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
451.0587 455.7392 443.9443 418.8344 387.1376 357.3470 337.4451 332.7646 344.5595 369.6694 401.3662 431.1568 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 (69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)
-116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 (71)
Water heating gains (Table 5)
103.8701 101.3856 96.8256 87.1325 81.1186 74.8557 71.1490 74.4298 78.2451 85.1853 94.4915 102.6568 (72)
Total internal gains
705.5192 703.8939 681.8699 641.0693 598.6394 557.4098 534.7512 537.1728 558.4521 599.4999 645.2220 685.3540 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.5100	0.7200	0.7700	85.3898	(77)
Northwest	7.1600	11.2829	0.5100	0.7200	0.7700	20.5575	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	126.1194	228.3566	348.3822	491.8945	605.9399	625.7407	593.2171	504.4370	397.4979	262.0716	153.5256	106.3377	(83)
Total gains	831.6386	932.2505	1030.2521	1132.9638	1204.5794	1183.1505	1127.9683	1041.6099	955.9500	861.5715	798.7476	791.6917	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	
alpha	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	

util living area
0.9861 0.9772 0.9569 0.9064 0.8028 0.6448 0.4939 0.5496 0.7755 0.9327 0.9778 0.9885 (86)

MIT	19.3552	19.5583	19.8994	20.3260	20.6945	20.9063	20.9746	20.9615	20.8019	20.3261	19.7487	19.2946	(87)
Th 2	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	(88)

util rest of house
0.9833 0.9726 0.9478 0.8862 0.7608 0.5731 0.4004 0.4538 0.7140 0.9139 0.9724 0.9861 (89)

MIT 2	18.1658	18.4233	18.8533	19.3799	19.8103	20.0295	20.0854	20.0774	19.9355	19.3902	18.6677	18.0887	(90)

Living area fraction fLA = Living area / (4) = 0.1973 (91)

MIT	18.4004	18.6472	19.0597	19.5665	19.9847	20.2025	20.2608	20.2518	20.1064	19.5748	18.8810	18.3266	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2504	18.4972	18.9097	19.4165	19.8347	20.0525	20.1108	20.1018	19.9564	19.4248	18.7310	18.1766	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9750	0.9613	0.9323	0.8677	0.7470	0.5693	0.4018	0.4543	0.7031	0.8959	0.9611	0.9788	(94)
Useful gains	810.8261	896.1414	960.5038	983.1191	899.7900	673.5462	453.1970	473.1916	672.1248	771.8820	767.6547	774.8879	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)

Heat loss rate W
1833.6338 1787.2132 1631.1194 1382.2821 1069.2199 716.6740 461.4587 486.5677 769.7658 1159.9316 1528.7663 1837.0775 (97)

Space heating kWh													
	760.9689	598.8003	498.9380	287.3973	126.0558	0.0000	0.0000	0.0000	0.0000	288.7089	548.0003	790.2691	(98a)
Space heating requirement - total per year (kWh/year)												3899.1386	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	760.9689	598.8003	498.9380	287.3973	126.0558	0.0000	0.0000	0.0000	0.0000	288.7089	548.0003	790.2691	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3899.1386	
Space heating per m2											(98c) / (4) =	29.1481	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												88.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	760.9689	598.8003	498.9380	287.3973	126.0558	0.0000	0.0000	0.0000	0.0000	288.7089	548.0003	790.2691	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	861.7995	678.1430	565.0487	325.4783	142.7586	0.0000	0.0000	0.0000	0.0000	326.9636	620.6119	894.9819	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0873	88.0678	88.0226	87.9323	87.7393	87.3000	87.3000	87.3000	87.3000	87.9307	88.0515	88.0955	(217)
Fuel for water heating, kWh/month													
	230.6834	203.3532	215.1570	187.8794	181.3235	162.9741	160.3261	167.6338	170.4392	190.0865	203.4224	228.0242	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	29.9163	23.9999	21.6093	15.8319	12.2290	9.9912	11.1557	14.5006	18.8349	24.7123	27.9125	30.7477	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.6117	-44.3054	-73.1062	-92.0863	-106.1278	-101.4771	-99.7527	-90.3226	-74.2065	-54.3255	-31.8591	-23.0679	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.6044	-23.6534	-56.8996	-100.7215	-146.6403	-152.6246	-148.6566	-117.2911	-75.1444	-36.5526	-13.4706	-7.2582	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4415.7855	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2301.3026	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)													
mechanical ventilation fans (SFP = 0.1950)												81.9360	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												167.9360	(231)
Electricity for lighting (calculated in Appendix L)												241.4413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1706.7660	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												5641.0977	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4415.7855	3.6400	160.7346	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.3026	3.6400	83.7674	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	241.4413	16.4900	39.8137	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.2488	16.4900	-134.9292	
PV Unit electricity exported	-888.5171	5.5900	-49.6681	
Total			-184.5973	(252)
Total energy cost			255.9195	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5154	(257)
SAP value		91.6460	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4415.7855	0.2100	927.3150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.3026	0.2100	483.2736	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1410.5885	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	241.4413	0.1443	34.8474	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.2488	0.1324	-108.3302	
PV Unit electricity exported	-888.5171	0.1220	-108.4402	
Total			-216.7704	(269)
Total CO2, kg/year			1282.7617	(272)
CO2 emissions per m2			9.5900	(273)
EI value			90.3848	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8500	(17)
Infiltration rate		0.1425	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1211	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1302	0.1242	0.1242	0.1151	0.1181	0.1030	0.1030	0.0999	0.1030	0.1151	0.1120	0.1211	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)

Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-600mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.5260			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0850 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	74.6110 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	131.4393	(39)
Average = Sum(39)m / 12 =												131.4393	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	0.9826	(40)
HLP (average)												0.9826	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9041 (42)
Hot water usage for mixer showers												
	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223 (42a)
Hot water usage for baths												
	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717 (42b)
Hot water usage for other uses												
	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714 (42c)
Average daily hot water use (litres/day)												114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.1785	30.3571	24.6880	18.6904	13.9713	11.7952	12.7451	16.5666	22.2356	28.2332	32.9523	35.1284	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568 (72)

Total internal gains

	705.5192	703.8939	681.8699	641.0693	598.6394	557.4098	534.7512	537.1728	558.4521	599.4999	645.2220	685.3540 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	43.0593	0.5100	0.7200	0.7700	99.9304	(77)
Northwest	7.1600	13.7804	0.5100	0.7200	0.7700	25.1080	(81)
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)

Solar gains	149.6754	237.6611	362.0994	522.0527	628.2426	686.6559	644.4209	560.9048	441.5365	293.3716	179.6568	126.8201	(83)
Total gains	855.1947	941.5550	1043.9693	1163.1220	1226.8820	1244.0657	1179.1721	1098.0777	999.9886	892.8715	824.8788	812.1741	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	43.8896	
alpha	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	3.9260	
util living area	0.9821	0.9723	0.9458	0.8761	0.7370	0.5245	0.3632	0.3998	0.6935	0.9055	0.9695	0.9849	(86)
MIT	19.5047	19.6895	20.0428	20.4738	20.8080	20.9630	20.9935	20.9906	20.8862	20.4735	19.9126	19.4569	(87)
Th 2	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	20.0979	(88)
util rest of house	0.9783	0.9665	0.9341	0.8493	0.6830	0.4427	0.2662	0.2972	0.6167	0.8788	0.9619	0.9817	(89)
MIT 2	18.3562	18.5898	19.0329	19.5567	19.9319	20.0761	20.0959	20.0948	20.0160	19.5676	18.8750	18.2958	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.5827	18.8068	19.2321	19.7376	20.1048	20.2511	20.2730	20.2715	20.1877	19.7463	19.0797	18.5248	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4327	18.6568	19.0821	19.5876	19.9548	20.1011	20.1230	20.1215	20.0377	19.5963	18.9297	18.3748	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9685	0.9539	0.9172	0.8314	0.6736	0.4430	0.2689	0.2999	0.6111	0.8604	0.9484	0.9728	(94)
Useful gains	828.2208	898.1118	957.5779	967.0067	826.4533	551.0930	317.1072	329.3210	611.1142	768.1948	782.3315	790.0969	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1752.4465	1703.0295	1535.4880	1273.3317	927.2755	565.3281	318.4720	331.4251	662.1489	1064.1741	1436.5904	1744.8330	(97)
Space heating kWh	687.6240	540.9046	429.9651	220.5539	75.0117	0.0000	0.0000	0.0000	0.0000	220.2086	471.0664	710.3237	(98a)
Space heating requirement - total per year (kWh/year)												3355.6580	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	687.6240	540.9046	429.9651	220.5539	75.0117	0.0000	0.0000	0.0000	0.0000	220.2086	471.0664	710.3237	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3355.6580	
Space heating per m2											(98c) / (4) =	25.0853	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	88.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	687.6240	540.9046	429.9651	220.5539	75.0117	0.0000	0.0000	0.0000	0.0000	220.2086	471.0664	710.3237	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	778.7361	612.5760	486.9367	249.7780	84.9510	0.0000	0.0000	0.0000	0.0000	249.3868	533.4840	804.4436	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0699	88.0491	87.9918	87.8689	87.6179	87.3000	87.3000	87.3000	87.3000	87.8657	88.0222	88.0776	(217)
Fuel for water heating, kWh/month	230.7291	203.3962	215.2322	188.0149	181.5746	162.9741	160.3261	167.6338	170.4392	190.2271	203.4902	228.0705	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	29.9163	23.9999	21.6093	15.8319	12.2290	9.9912	11.1557	14.5006	18.8349	24.7123	27.9125	30.7477	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.6674	-46.6208	-76.0647	-96.0465	-108.4633	-106.5709	-104.2890	-96.2109	-80.0108	-59.9702	-37.0293	-27.4937	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.8025	-25.9384	-61.5045	-110.4082	-154.4710	-172.6541	-166.1450	-136.0830	-88.2576	-44.1303	-17.5360	-9.7644	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3800.2921	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2302.1079	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	241.4413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1871.1326	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4862.0430	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3800.2921	7.3200	278.1814	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.1079	7.3200	168.5143	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	241.4413	27.6700	66.8068	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4376	27.6700	-241.1268	
PV Unit electricity exported	-999.6950	5.8100	-58.0823	
Total			-299.2091	(252)
Total energy cost			430.0222	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3800.2921	0.2100	798.0613	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.1079	0.2100	483.4427	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1281.5040	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	241.4413	0.1443	34.8474	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4376	0.1327	-115.6042	
PV Unit electricity exported	-999.6950	0.1220	-121.9480	
Total			-237.5522	(269)
Total CO2, kg/year			1132.8955	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3800.2921	1.1300	4294.3301	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.1079	1.1300	2601.3820	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6895.7121	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	241.4413	1.5338	370.3308	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4376	1.4902	-1298.5903	
PV Unit electricity exported	-999.6950	0.4475	-447.3750	
Total			-1745.9653	(283)
Total Primary energy kWh/year			6109.4019	(286)

Summary for Input Data

elmhurst energy

Plot Reference	Plot 52	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	6 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.69	**TER**	10.40
Environmental	91 B	**% DER < TER**			6.83
CO_2 Emissions (t/year)	1.12	**DFEE**	36.04	**TFEE**	37.63
Compliance Check	See BREL	**% DFEE < TFEE**			4.22
% DPER < TPER	3.64	**DPER**	52.38	**TPER**	54.36

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, Semi-Detached	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	155.25	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	19.44 m	47.23 m²	2.40 m
1st Storey:	18.60 m	43.27 m²	2.67 m
2nd Storey:	18.60 m	43.27 m²	2.67 m

8.0 Living Area	26.39	m²	

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.25	60.00	145.98	121.71	0.00	None	24.27	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	75.19	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	76.62
Internal Wall 2	Plasterboard on timber frame	9.00	86.39
Internal Wall 3	Plasterboard on timber frame	9.00	70.08

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof-500mm	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	32.20	32.20	None	0.00	Enter Gross Area	0.00
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.91	3.91	None	0.00	Enter Gross Area	0.00
Sloping Roof	External Slope Roof	Plasterboard, insulated slope	0.12	9.00	10.21	10.21	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.23
Internal Ceiling 2	+2	Plasterboard ceiling, carpeted chipboard floor	9.00	43.27

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground FLoor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	47.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27
Internal Floor 2	+2	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Window-GF-FF	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Front Door	Brickwork	South East	2.15	
Patio Door	Window-GF-FF	Brickwork	North West	5.85	
NW	Window	Brickwork	North West	7.16	
SE	Window	Brickwork	South East	9.12	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	11.93	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.30	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	45.31	0.01	0.01	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.44	0.07	0.07	RCD	Yes
E6 Intermediate floor within a dwelling	Gov Approved Scheme	37.22	0.00	0.00	RCD	No
E16 Corner (normal)	Gov Approved Scheme	16.00	0.05	0.05	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	16.00	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.97	0.06	0.06	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	18.28	0.00	0.00		No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	9.97	0.04	0.04	RCD	No
E11 Eaves (insulation at rafter level)	Gov Approved Scheme	9.13	0.01	0.01	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.12	0.04	0.04	RCD	No
E15 Flat roof with parapet	Independently assessed	6.41	0.09	0.09	AbbeyCalculated	No
E13 Gable (insulation at rafter level)	Non Gov Approved Schemes	2.47	0.04	0.04	RCD	No

Y-value	0.03	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500755
Duct Type	Rigid
Wet Rooms	5

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	1
0.15	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0

0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.24	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
PD	106.00	8.00	848.00	12
DL	106.00	8.00	848.00	26

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	16636	
Fuel Type	Mains gas	
In Winter	88.30	
In Summer	87.30	
Model Name	Logic Code Combi	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	Standard Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

Summary for Input Data

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1
Ensuite 2	Instantaneous electric shower		9.30	No	

28.3 Waste Water Heat Recovery System
Instantaneous System 1

Database ID	80116
Brand Model	Showersave, QB1-21
Details	Year: 2017 + current Efficiency: 69.85 Utilisation factor: 0.973

29.0 Hot Water Cylinder None

32.0 Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
2.35	West	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations
Lower cost measures
None
Further measures to achieve even higher standards
None

Full SAP Calculation Printout

Plot Reference	Plot 52	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	6 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.69	**TER**	10.40
Environmental	91 B	**% DER < TER**			6.83
CO_2 Emissions (t/year)	1.12	**DFEE**	36.04	**TFEE**	37.63
Compliance Check	See BREL	**% DFEE < TFEE**			4.22
% DPER < TPER	3.64	**DPER**	52.38	**TPER**	54.36

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2400	(17)
Infiltration rate		0.1620	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1377	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1756	0.1721	0.1687	0.1515	0.1480	0.1308	0.1308	0.1274	0.1377	0.1480	0.1549	0.1618	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.6438			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0889 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 74.7327 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	(39)

Average = Sum(39)m / 12 = 131.5610

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	(40)
HLP (average)												0.9835	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892
Distribution loss (46)m = 0.15 x (45)m

29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)

Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)
12Total per year (kWh/year) 2020 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.6460	651.2265	621.8349	600.5850	568.0674	544.1116	521.8038	521.9486	538.9333	560.4304	596.2403	619.0985	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	781.0587	917.2259	1025.3669	1166.9228	1262.9669	1260.6216	1201.5114	1101.6713	998.2034	865.0882	775.5203	743.4971	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	
alpha	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	
util living area	0.9888	0.9784	0.9575	0.8992	0.7840	0.6152	0.4672	0.5244	0.7574	0.9320	0.9798	0.9907	(86)
MIT	19.2960	19.5401	19.8928	20.3511	20.7210	20.9204	20.9790	20.9672	20.8186	20.3279	19.7217	19.2376	(87)
Th 2	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	(88)
util rest of house	0.9865	0.9740	0.9486	0.8779	0.7404	0.5441	0.3774	0.4314	0.6944	0.9131	0.9749	0.9888	(89)
MIT 2	18.0901	18.3998	18.8446	19.4086	19.8368	20.0399	20.0869	20.0799	19.9501	19.3918	18.6333	18.0157	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3280	18.6248	19.0514	19.5945	20.0113	20.2136	20.2629	20.2550	20.1214	19.5765	18.8480	18.2568	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1780	18.4748	18.9014	19.4445	19.8613	20.0636	20.1129	20.1050	19.9714	19.4265	18.6980	18.1068	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9630	0.9331	0.8594	0.7277	0.5413	0.3790	0.4322	0.6846	0.8950	0.9642	0.9824	(94)
Useful gains	764.8352	883.2793	956.8156	1002.8850	919.0717	682.4162	455.4033	476.1398	683.3401	774.2648	747.7225	730.4447	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1825.8092	1785.9134	1631.5349	1387.2509	1073.7028	718.8012	462.1638	487.4306	772.4484	1161.2240	1525.8503	1829.5909	(97)
Space heating kWh	789.3646	606.5701	501.9912	276.7435	115.0456	0.0000	0.0000	0.0000	0.0000	287.8976	560.2520	817.7648	(98a)
Space heating requirement - total per year (kWh/year)												3955.6293	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	789.3646	606.5701	501.9912	276.7435	115.0456	0.0000	0.0000	0.0000	0.0000	287.8976	560.2520	817.7648	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3955.6293	
Space heating per m2											(98c) / (4) =	29.5704	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	789.3646	606.5701	501.9912	276.7435	115.0456	0.0000	0.0000	0.0000	0.0000	287.8976	560.2520	817.7648	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	893.9577	686.9423	568.5064	313.4128	130.2894	0.0000	0.0000	0.0000	0.0000	326.0449	634.4870	926.1209	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0934	88.0700	88.0238	87.9235	87.7169	87.3000	87.3000	87.3000	87.3000	87.9300	88.0556	88.1010	(217)
Fuel for water heating, kWh/month	230.6675	203.3479	215.1540	187.8982	181.3698	162.9741	160.3261	167.6338	170.4392	190.0879	203.4129	228.0099	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.6129	-44.3078	-73.1106	-92.0921	-106.1341	-101.4830	-99.7591	-90.3295	-74.2126	-54.3294	-31.8608	-23.0689	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.6032	-23.6510	-56.8951	-100.7157	-146.6340	-152.6188	-148.6502	-117.2842	-75.1383	-36.5487	-13.4689	-7.2572	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	4479.7614	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.3213	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1706.7660	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5706.0272	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4479.7614	0.2100	940.7499	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.3213	0.2100	483.2775	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1424.0274	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.3007	0.1324	-108.3370	
PV Unit electricity exported	-888.4653	0.1220	-108.4335	
Total			-216.7705	(269)
Total CO2, kg/year			1296.3354	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.6900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4479.7614	1.1300	5062.1304	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.3213	1.1300	2600.4930	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7662.6234	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.3007	1.4892	-1218.5978	
PV Unit electricity exported	-888.4653	0.4478	-397.8583	
Total			-1616.4561	(283)
Total Primary energy kWh/year			7007.2566	(286)
Dwelling Primary energy Rate (DPER)			52.3800	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping Roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	155.2498	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9623	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	75.5931	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff													
	141.3692	141.0217	140.6811	139.0815	138.7822	137.3889	137.3889	137.1309	137.9256	138.7822	139.3876	140.0206	(39)
Average = Sum(39)m / 12 =												139.0800	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0568	1.0542	1.0517	1.0397	1.0375	1.0271	1.0271	1.0251	1.0311	1.0375	1.0420	1.0467	(40)
HLP (average)												1.0397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m													
	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8068	40.9073	41.0064	41.4780	41.5675	41.9890	41.9890	42.0680	41.8256	41.5675	41.3869	41.1998	
alpha	3.7205	3.7272	3.7338	3.7652	3.7712	3.7993	3.7993	3.8045	3.7884	3.7712	3.7591	3.7467	
util living area													
	0.9882	0.9781	0.9583	0.9032	0.7943	0.6272	0.4795	0.5356	0.7661	0.9333	0.9792	0.9901	(86)
MIT	19.1582	19.4096	19.7784	20.2760	20.6751	20.9054	20.9737	20.9603	20.7919	20.2671	19.6325	19.1210	(87)
Th 2	20.0363	20.0384	20.0405	20.0504	20.0522	20.0608	20.0608	20.0624	20.0575	20.0522	20.0485	20.0446	(88)
util rest of house													
	0.9857	0.9735	0.9493	0.8820	0.7503	0.5536	0.3847	0.4382	0.7020	0.9141	0.9741	0.9880	(89)
MIT 2	17.8749	18.1953	18.6623	19.2831	19.7491	19.9930	20.0483	20.0419	19.8891	19.2852	18.4880	17.8329	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.1280	18.4349	18.8825	19.4790	19.9318	20.1730	20.2308	20.2231	20.0672	19.4789	18.7138	18.0870	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1280	18.4349	18.8825	19.4790	19.9318	20.1730	20.2308	20.2231	20.0672	19.4789	18.7138	18.0870	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9630	0.9352	0.8667	0.7440	0.5629	0.4024	0.4557	0.7027	0.8995	0.9640	0.9816	(94)
Useful gains	782.3687	900.9076	975.3844	1025.0990	950.7532	717.3634	488.6931	508.0994	711.2891	791.7645	763.8504	747.7861	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1954.8584	1908.7109	1741.9799	1471.3381	1142.4243	765.6664	498.8374	524.2592	823.0335	1232.2365	1618.8204	1944.4701	(97)
Space heating kWh													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98a)
Space heating requirement - total per year (kWh/year)												4417.4410	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4417.4410	
Space heating per m2											(98c) / (4) =	33.0227	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	944.0826	732.9479	617.2587	347.7188	154.3325	0.0000	0.0000	0.0000	0.0000	354.6658	666.2103	963.5638	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652 (64)

Efficiency of water heater 80.3000 (216)

(217)m	86.8083	86.5960	86.1832	85.2925	83.6328	80.3000	80.3000	80.3000	80.3000	85.3077	86.4209	86.8570 (217)

Fuel for water heating, kWh/month

	291.7108	258.5103	276.0436	245.8655	243.4041	228.8498	226.3471	235.2227	237.6393	248.9202	260.5862	288.4801 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4780.7803 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	3041.5796 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	264.9585 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2334.4611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5838.8574 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4780.7803	0.2100	1003.9639	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3041.5796	0.2100	638.7317	(264)
Space and water heating			1642.6956	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1390.6985	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4780.7803	1.1300	5402.2818	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3041.5796	1.1300	3436.9850	(278)
Space and water heating			8839.2668	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			7272.0954	(286)
Target Primary Energy Rate (TPER)			54.3600	(287)

Full SAP Calculation Printout

Plot Reference	Plot 52	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	6 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.69	**TER**	10.40
Environmental	91 B	**% DER < TER**			6.83
CO_2 Emissions (t/year)	1.12	**DFEE**	36.04	**TFEE**	37.63
Compliance Check	See BREL	**% DFEE < TFEE**			4.22
% DPER < TPER	3.64	**DPER**	52.38	**TPER**	54.36

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2400	(17)
Infiltration rate		0.2781	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2364	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3014	0.2955	0.2896	0.2601	0.2541	0.2246	0.2246	0.2187	0.2364	0.2541	0.2660	0.2778	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5454	0.5437	0.5419	0.5338	0.5323	0.5252	0.5252	0.5239	0.5279	0.5323	0.5354	0.5386	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.6438			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)

Internal Floor 2	43.2700	18.0000	778.8600	(32d)
Internal Ceiling 1	47.2300	9.0000	425.0700	(32e)
Internal Ceiling 2	43.2700	9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0889 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 74.7327 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.9918	61.7913	61.5948	60.6717	60.4989	59.6949	59.6949	59.5460	60.0046	60.4989	60.8483	61.2136	(38)
Heat transfer coeff	136.7246	136.5241	136.3275	135.4044	135.2317	134.4277	134.4277	134.2788	134.7374	135.2317	135.5811	135.9464	(39)
Average = Sum(39)m / 12 =												135.4036	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0221	1.0206	1.0191	1.0122	1.0109	1.0049	1.0049	1.0038	1.0072	1.0109	1.0135	1.0163	(40)
HLP (average)												1.0122	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
										Total per year (kWh/year) = Sum(64)m =		981.4310	(64)
12Total per year (kWh/year)												981	(64)
Electric shower(s)	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												664.1943	(64a)
Heat gains from water heating, kWh/month	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.1930	42.2550	42.3159	42.6044	42.6588	42.9140	42.9140	42.9615	42.8153	42.6588	42.5489	42.4345	
alpha	3.8129	3.8170	3.8211	3.8403	3.8439	3.8609	3.8609	3.8641	3.8544	3.8439	3.8366	3.8290	
util living area	0.9912	0.9825	0.9647	0.9121	0.8045	0.6364	0.4868	0.5464	0.7796	0.9428	0.9839	0.9928	(86)
MIT	19.1518	19.4043	19.7738	20.2716	20.6749	20.9056	20.9741	20.9600	20.7878	20.2518	19.6142	19.1063	(87)
Th 2	20.0650	20.0662	20.0674	20.0732	20.0742	20.0792	20.0792	20.0802	20.0773	20.0742	20.0721	20.0698	(88)
util rest of house	0.9894	0.9788	0.9570	0.8925	0.7620	0.5637	0.3926	0.4494	0.7177	0.9260	0.9798	0.9913	(89)
MIT 2	18.3665	18.6176	18.9829	19.4676	19.8361	20.0260	20.0695	20.0637	19.9418	19.4583	18.8320	18.3247	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.5214	18.7728	19.1390	19.6262	20.0016	20.1995	20.2479	20.2406	20.1087	19.6148	18.9863	18.4789	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5214	18.7728	19.1390	19.6262	20.0016	20.1995	20.2479	20.2406	20.1087	19.6148	18.9863	18.4789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9851	0.9720	0.9472	0.8813	0.7583	0.5738	0.4104	0.4671	0.7200	0.9156	0.9734	0.9876	(94)
Useful gains	717.2606	841.2125	924.4585	990.0046	927.3327	704.1127	480.3258	499.2621	693.6381	753.7566	708.7746	682.7310	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1944.4208	1893.9741	1723.0373	1452.3718	1122.6373	752.7302	490.3818	515.7044	809.6003	1219.0902	1611.5641	1941.1667	(97)
Space heating kWh	913.0071	707.4558	594.1426	332.9044	145.3066	0.0000	0.0000	0.0000	0.0000	346.2082	650.0085	936.2761	(98a)
Space heating requirement - total per year (kWh/year)												4625.3094	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	913.0071	707.4558	594.1426	332.9044	145.3066	0.0000	0.0000	0.0000	0.0000	346.2082	650.0085	936.2761	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4625.3094	
Space heating per m2										(98c) / (4) =		34.5766	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1263.6201	994.7647	1020.5187	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8233	0.8852	0.8491	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1040.3609	880.6132	866.5403	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	232.5958	312.2529	236.8046	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.1489	78.0632	59.2011	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												195.4133	(107)
Energy for space heating												34.5766	(99)
Energy for space cooling												1.4608	(108)
Total												36.0374	(109)
Fabric Energy Efficiency (DFEE)												36.0	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping Roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498	(35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9623	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	75.5931	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	141.3692	141.0217	140.6811	139.0815	138.7822	137.3889	137.3889	137.1309	137.9256	138.7822	139.3876	140.0206	(39)
Average = Sum(39)m / 12 =												139.0800	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0568	1.0542	1.0517	1.0397	1.0375	1.0271	1.0271	1.0251	1.0311	1.0375	1.0420	1.0467	(40)
HLP (average)												1.0397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.9041	(42)
Hot water usage for mixer showers	0.0000	0.0000	(42a)
Hot water usage for baths	31.4781	31.0106	(42b)
Hot water usage for other uses	44.3714	42.7578	(42c)
Average daily hot water use (litres/day)		69.5228	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
										Total per year (kWh/year) = Sum(64)m =		981.4310	(64)
12Total per year (kWh/year)												981	(64)
Electric shower(s)													
	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		664.1943	(64a)
Heat gains from water heating, kWh/month													
	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains													
	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8068	40.9073	41.0064	41.4780	41.5675	41.9890	41.9890	42.0680	41.8256	41.5675	41.3869	41.1998	
alpha	3.7205	3.7272	3.7338	3.7652	3.7712	3.7993	3.7993	3.8045	3.7884	3.7712	3.7591	3.7467	
util living area													
	0.9913	0.9828	0.9657	0.9150	0.8112	0.6448	0.4953	0.5548	0.7863	0.9445	0.9841	0.9928	(86)
MIT	19.0780	19.3339	19.7115	20.2285	20.6479	20.8960	20.9707	20.9553	20.7707	20.2152	19.5627	19.0412	(87)
Th 2	20.0363	20.0384	20.0405	20.0504	20.0522	20.0608	20.0608	20.0624	20.0575	20.0522	20.0485	20.0446	(88)
util rest of house													
	0.9894	0.9792	0.9581	0.8957	0.7688	0.5709	0.3983	0.4554	0.7241	0.9279	0.9801	0.9912	(89)
MIT 2	18.2724	18.5277	18.9018	19.4089	19.7940	20.0022	20.0498	20.0442	19.9110	19.4064	18.7638	18.2418	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.4314	18.6868	19.0615	19.5706	19.9625	20.1785	20.2315	20.2239	20.0806	19.5660	18.9214	18.3995	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4314	18.6868	19.0615	19.5706	19.9625	20.1785	20.2315	20.2239	20.0806	19.5660	18.9214	18.3995	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9722	0.9481	0.8841	0.7643	0.5808	0.4165	0.4734	0.7259	0.9172	0.9736	0.9875	(94)
Useful gains	717.1990	841.3801	925.3460	993.1161	934.5869	712.6854	487.5187	505.9940	699.2749	755.0671	708.8703	682.6615	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1997.7394	1944.2313	1767.1691	1484.0759	1146.6848	766.4228	498.9257	524.3789	824.8830	1244.3208	1647.7623	1988.2280	(97)
Space heating kWh													
	952.7221	741.1160	626.3164	353.4910	157.8008	0.0000	0.0000	0.0000	0.0000	364.0047	676.0022	971.3415	(98a)
Space heating requirement - total per year (kWh/year)												4842.7947	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	952.7221	741.1160	626.3164	353.4910	157.8008	0.0000	0.0000	0.0000	0.0000	364.0047	676.0022	971.3415	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4842.7947	
Space heating per m2											(98c) / (4) =	36.2024	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Full SAP Calculation Printout

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1291.4559	1016.6781	1042.1950	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8125	0.8764	0.8394	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1049.3516	891.0301	874.7863	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	226.1225	304.5027	230.6695	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	56.5306	76.1257	57.6674	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												190.3237	(107)
Energy for space heating												36.2024	(99)
Energy for space cooling												1.4228	(108)
Total												37.6252	(109)
Fabric Energy Efficiency (TFEE)												37.6	(109)

Full SAP Calculation Printout

Plot Reference	Plot 52	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	6 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.69	**TER**	10.40
Environmental	91 B	**% DER < TER**			6.83
CO_2 Emissions (t/year)	1.12	**DFEE**	36.04	**TFEE**	37.63
Compliance Check	See BREL	**% DFEE < TFEE**			4.22
% DPER < TPER	3.64	**DPER**	52.38	**TPER**	54.36

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2400	(17)
Infiltration rate		0.1620	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1377	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1756	0.1721	0.1687	0.1515	0.1480	0.1308	0.1308	0.1274	0.1377	0.1480	0.1549	0.1618	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.6438			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0889 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 74.7327 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	(39)

Average = Sum(39)m / 12 = 131.5610

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	(40)
HLP (average)												0.9835	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892
Distribution loss (46)m = 0.15 x (45)m

29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)

Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)
12Total per year (kWh/year) 2020 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.6460	651.2265	621.8349	600.5850	568.0674	544.1116	521.8038	521.9486	538.9333	560.4304	596.2403	619.0985	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	781.0587	917.2259	1025.3669	1166.9228	1262.9669	1260.6216	1201.5114	1101.6713	998.2034	865.0882	775.5203	743.4971	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	
alpha	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	
util living area	0.9888	0.9784	0.9575	0.8992	0.7840	0.6152	0.4672	0.5244	0.7574	0.9320	0.9798	0.9907	(86)
MIT	19.2960	19.5401	19.8928	20.3511	20.7210	20.9204	20.9790	20.9672	20.8186	20.3279	19.7217	19.2376	(87)
Th 2	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	(88)
util rest of house	0.9865	0.9740	0.9486	0.8779	0.7404	0.5441	0.3774	0.4314	0.6944	0.9131	0.9749	0.9888	(89)
MIT 2	18.0901	18.3998	18.8446	19.4086	19.8368	20.0399	20.0869	20.0799	19.9501	19.3918	18.6333	18.0157	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3280	18.6248	19.0514	19.5945	20.0113	20.2136	20.2629	20.2550	20.1214	19.5765	18.8480	18.2568	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1780	18.4748	18.9014	19.4445	19.8613	20.0636	20.1129	20.1050	19.9714	19.4265	18.6980	18.1068	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9630	0.9331	0.8594	0.7277	0.5413	0.3790	0.4322	0.6846	0.8950	0.9642	0.9824	(94)
Useful gains	764.8352	883.2793	956.8156	1002.8850	919.0717	682.4162	455.4033	476.1398	683.3401	774.2648	747.7225	730.4447	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1825.8092	1785.9134	1631.5349	1387.2509	1073.7028	718.8012	462.1638	487.4306	772.4484	1161.2240	1525.8503	1829.5909	(97)
Space heating kWh	789.3646	606.5701	501.9912	276.7435	115.0456	0.0000	0.0000	0.0000	0.0000	287.8976	560.2520	817.7648	(98a)
Space heating requirement - total per year (kWh/year)												3955.6293	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	789.3646	606.5701	501.9912	276.7435	115.0456	0.0000	0.0000	0.0000	0.0000	287.8976	560.2520	817.7648	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3955.6293	
Space heating per m2											(98c) / (4) =	29.5704	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	789.3646	606.5701	501.9912	276.7435	115.0456	0.0000	0.0000	0.0000	0.0000	287.8976	560.2520	817.7648	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	893.9577	686.9423	568.5064	313.4128	130.2894	0.0000	0.0000	0.0000	0.0000	326.0449	634.4870	926.1209	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0934	88.0700	88.0238	87.9235	87.7169	87.3000	87.3000	87.3000	87.3000	87.9300	88.0556	88.1010	(217)
Fuel for water heating, kWh/month	230.6675	203.3479	215.1540	187.8982	181.3698	162.9741	160.3261	167.6338	170.4392	190.0879	203.4129	228.0099	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.6129	-44.3078	-73.1106	-92.0921	-106.1341	-101.4830	-99.7591	-90.3295	-74.2126	-54.3294	-31.8608	-23.0689	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.6032	-23.6510	-56.8951	-100.7157	-146.6340	-152.6188	-148.6502	-117.2842	-75.1383	-36.5487	-13.4689	-7.2572	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	4479.7614	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.3213	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1706.7660	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5706.0272	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4479.7614	0.2100	940.7499	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.3213	0.2100	483.2775	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1424.0274	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.3007	0.1324	-108.3370	
PV Unit electricity exported	-888.4653	0.1220	-108.4335	
Total			-216.7705	(269)
Total CO2, kg/year			1296.3354	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.6900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4479.7614	1.1300	5062.1304	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.3213	1.1300	2600.4930	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7662.6234	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.3007	1.4892	-1218.5978	
PV Unit electricity exported	-888.4653	0.4478	-397.8583	
Total			-1616.4561	(283)
Total Primary energy kWh/year			7007.2566	(286)
Dwelling Primary energy Rate (DPER)			52.3800	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping Roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	155.2498	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9623	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	75.5931	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff													
	141.3692	141.0217	140.6811	139.0815	138.7822	137.3889	137.3889	137.1309	137.9256	138.7822	139.3876	140.0206	(39)
Average = Sum(39)m / 12 =												139.0800	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0568	1.0542	1.0517	1.0397	1.0375	1.0271	1.0271	1.0251	1.0311	1.0375	1.0420	1.0467	(40)
HLP (average)												1.0397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m													
	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8068	40.9073	41.0064	41.4780	41.5675	41.9890	41.9890	42.0680	41.8256	41.5675	41.3869	41.1998	
alpha	3.7205	3.7272	3.7338	3.7652	3.7712	3.7993	3.7993	3.8045	3.7884	3.7712	3.7591	3.7467	
util living area													
	0.9882	0.9781	0.9583	0.9032	0.7943	0.6272	0.4795	0.5356	0.7661	0.9333	0.9792	0.9901	(86)
MIT	19.1582	19.4096	19.7784	20.2760	20.6751	20.9054	20.9737	20.9603	20.7919	20.2671	19.6325	19.1210	(87)
Th 2	20.0363	20.0384	20.0405	20.0504	20.0522	20.0608	20.0608	20.0624	20.0575	20.0522	20.0485	20.0446	(88)
util rest of house													
	0.9857	0.9735	0.9493	0.8820	0.7503	0.5536	0.3847	0.4382	0.7020	0.9141	0.9741	0.9880	(89)
MIT 2	17.8749	18.1953	18.6623	19.2831	19.7491	19.9930	20.0483	20.0419	19.8891	19.2852	18.4880	17.8329	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.1280	18.4349	18.8825	19.4790	19.9318	20.1730	20.2308	20.2231	20.0672	19.4789	18.7138	18.0870	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1280	18.4349	18.8825	19.4790	19.9318	20.1730	20.2308	20.2231	20.0672	19.4789	18.7138	18.0870	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9630	0.9352	0.8667	0.7440	0.5629	0.4024	0.4557	0.7027	0.8995	0.9640	0.9816	(94)
Useful gains	782.3687	900.9076	975.3844	1025.0990	950.7532	717.3634	488.6931	508.0994	711.2891	791.7645	763.8504	747.7861	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1954.8584	1908.7109	1741.9799	1471.3381	1142.4243	765.6664	498.8374	524.2592	823.0335	1232.2365	1618.8204	1944.4701	(97)
Space heating kWh													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98a)
Space heating requirement - total per year (kWh/year)												4417.4410	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4417.4410	
Space heating per m2											(98c) / (4) =	33.0227	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	944.0826	732.9479	617.2587	347.7188	154.3325	0.0000	0.0000	0.0000	0.0000	354.6658	666.2103	963.5638	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652 (64)

Efficiency of water heater 80.3000 (216)

(217)m	86.8083	86.5960	86.1832	85.2925	83.6328	80.3000	80.3000	80.3000	80.3000	85.3077	86.4209	86.8570 (217)

Fuel for water heating, kWh/month

	291.7108	258.5103	276.0436	245.8655	243.4041	228.8498	226.3471	235.2227	237.6393	248.9202	260.5862	288.4801 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4780.7803 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	3041.5796 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	264.9585 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2334.4611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5838.8574 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4780.7803	0.2100	1003.9639	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3041.5796	0.2100	638.7317	(264)
Space and water heating			1642.6956	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1390.6985	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4780.7803	1.1300	5402.2818	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3041.5796	1.1300	3436.9850	(278)
Space and water heating			8839.2668	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			7272.0954	(286)
Target Primary Energy Rate (TPER)			54.3600	(287)

Full SAP Calculation Printout

Plot Reference	Plot 52	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	6 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.69	**TER**	10.40
Environmental	91 B	**% DER < TER**			6.83
CO_2 Emissions (t/year)	1.12	**DFEE**	36.04	**TFEE**	37.63
Compliance Check	See BREL	**% DFEE < TFEE**			4.22
% DPER < TPER	3.64	**DPER**	52.38	**TPER**	54.36

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2400	(17)
Infiltration rate		0.1620	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1377	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1756	0.1721	0.1687	0.1515	0.1480	0.1308	0.1308	0.1274	0.1377	0.1480	0.1549	0.1618	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.6438			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0889 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 74.7327 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	(39)

Average = Sum(39)m / 12 = 131.5610

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	(40)
HLP (average)												0.9835	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892
Distribution loss (46)m = 0.15 x (45)m

29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Total heat required for water heating calculated for each month

224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS -21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)

Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	853.0643	970.0108	1085.4975	1207.4795	1293.5931	1273.9655	1214.5081	1116.9597	1017.8083	904.2670	824.6296	809.8886	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	
alpha	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	
util living area	0.9849	0.9741	0.9497	0.8902	0.7741	0.6102	0.4626	0.5182	0.7490	0.9232	0.9754	0.9876	(86)
MIT	19.3772	19.5969	19.9514	20.3817	20.7343	20.9227	20.9797	20.9685	20.8260	20.3621	19.7749	19.3132	(87)
Th 2	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	(88)
util rest of house	0.9819	0.9690	0.9394	0.8676	0.7297	0.5393	0.3736	0.4259	0.6854	0.9024	0.9695	0.9850	(89)
MIT 2	18.1931	18.4713	18.9168	19.4442	19.8504	20.0417	20.0873	20.0807	19.9568	19.4320	18.7000	18.1118	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.4267	18.6933	19.1209	19.6291	20.0248	20.2155	20.2634	20.2558	20.1283	19.6155	18.9120	18.3488	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2767	18.5433	18.9709	19.4791	19.8748	20.0655	20.1134	20.1058	19.9783	19.4655	18.7620	18.1988	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9568	0.9230	0.8492	0.7176	0.5367	0.3752	0.4268	0.6760	0.8841	0.9575	0.9773	(94)
Useful gains	830.0704	928.1243	1001.9128	1025.4469	928.3210	683.7177	455.6951	476.7336	688.0678	799.4723	789.5997	791.4943	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1838.7906	1794.9309	1640.6892	1391.7985	1075.4867	719.0424	462.2200	487.5439	773.3577	1166.3535	1534.2711	1841.7010	(97)
Space heating kWh	750.4878	582.4941	475.2497	263.7732	109.4913	0.0000	0.0000	0.0000	0.0000	272.9596	536.1634	781.3537	(98a)
Space heating requirement - total per year (kWh/year)												3771.9727	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	750.4878	582.4941	475.2497	263.7732	109.4913	0.0000	0.0000	0.0000	0.0000	272.9596	536.1634	781.3537	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3771.9727	
Space heating per m2										(98c) / (4) =		28.1974	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	750.4878	582.4941	475.2497	263.7732	109.4913	0.0000	0.0000	0.0000	0.0000	272.9596	536.1634	781.3537	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	849.9296	659.6762	538.2216	298.7239	123.9992	0.0000	0.0000	0.0000	0.0000	309.1275	607.2066	884.8853	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0850	88.0628	88.0127	87.9122	87.7049	87.3000	87.3000	87.3000	87.3000	87.9175	88.0474	88.0936	(217)
Fuel for water heating, kWh/month	230.6895	203.3647	215.1810	187.9225	181.3945	162.9741	160.3261	167.6338	170.4392	190.1149	203.4319	228.0290	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.6129	-44.3078	-73.1106	-92.0921	-106.1341	-101.4830	-99.7591	-90.3295	-74.2126	-54.3294	-31.8608	-23.0689	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.6032	-23.6510	-56.8951	-100.7157	-146.6340	-152.6188	-148.6502	-117.2842	-75.1383	-36.5487	-13.4689	-7.2572	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4271.7698	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.5011	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1706.7660	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5498.2154	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4271.7698	3.6400	155.4924	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.5011	3.6400	83.7746	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.3007	16.4900	-134.9378	
PV Unit electricity exported	-888.4653	5.5900	-49.6652	
Total			-184.6030	(252)
Total energy cost			250.8331	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5051	(257)
SAP value		91.8120	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4271.7698	0.2100	897.0717	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.5011	0.2100	483.3152	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1380.3869	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.3007	0.1324	-108.3370	
PV Unit electricity exported	-888.4653	0.1220	-108.4335	
Total			-216.7705	(269)
Total CO2, kg/year			1252.6949	(272)
CO2 emissions per m2			9.3600	(273)
EI value			90.6102	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2400	(17)
Infiltration rate		0.1620	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1377	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1480	0.1411	0.1411	0.1308	0.1343	0.1170	0.1170	0.1136	0.1170	0.1308	0.1274	0.1377	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.6438			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0889 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	74.7327 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	(39)
Average = Sum(39)m / 12 =												131.5610	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	(40)
HLP (average)												0.9835	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	880.4573	980.5819	1100.9378	1241.6296	1318.6356	1343.2233	1272.6765	1181.2951	1068.1552	940.3033	854.9654	833.7390	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	
alpha	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	
util living area	0.9803	0.9686	0.9370	0.8559	0.7047	0.4909	0.3378	0.3734	0.6630	0.8924	0.9659	0.9835	(86)
MIT	19.5305	19.7286	20.0939	20.5245	20.8368	20.9705	20.9949	20.9926	20.9029	20.5088	19.9422	19.4790	(87)
Th 2	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	(88)
util rest of house	0.9762	0.9621	0.9238	0.8265	0.6494	0.4126	0.2470	0.2768	0.5859	0.8632	0.9576	0.9800	(89)
MIT 2	18.3882	18.6381	19.0944	19.6132	19.9582	20.0800	20.0956	20.0947	20.0285	19.6070	18.9111	18.3232	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6136	18.8533	19.2916	19.7930	20.1315	20.2557	20.2730	20.2718	20.2010	19.7849	19.1146	18.5512	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4636	18.7033	19.1416	19.6430	19.9815	20.1057	20.1230	20.1218	20.0510	19.6349	18.9646	18.4012	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9486	0.9062	0.8094	0.6418	0.4134	0.2497	0.2795	0.5817	0.8450	0.9434	0.9707	(94)
Useful gains	850.3039	930.1779	997.6976	1004.9350	846.2387	555.2312	317.7269	330.1363	621.3341	794.5124	806.5467	809.2944	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1758.1281	1710.7218	1544.7329	1281.7971	931.6530	566.4619	318.7739	331.7759	664.5166	1070.2330	1442.5088	1749.9197	(97)
Space heating kWh	675.4212	524.5255	406.9943	199.3408	63.5482	0.0000	0.0000	0.0000	0.0000	205.1361	457.8927	699.8252	(98a)
Space heating requirement - total per year (kWh/year)												3232.6841	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													

	675.4212	524.5255	406.9943	199.3408	63.5482	0.0000	0.0000	0.0000	205.1361	457.8927	699.8252	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)											3232.6841	
Space heating per m2										(98c) / (4) =	24.1660	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)											0.0000	(201)
Fraction of space heat from main system(s)											1.0000	(202)
Efficiency of main space heating system 1 (in %)											88.3000	(206)
Efficiency of main space heating system 2 (in %)											0.0000	(207)
Efficiency of secondary/supplementary heating system, %											0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	675.4212	524.5255	406.9943	199.3408	63.5482	0.0000	0.0000	0.0000	0.0000	205.1361	457.8927	699.8252	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	764.9165	594.0267	460.9221	225.7540	71.9686	0.0000	0.0000	0.0000	0.0000	232.3173	518.5648	792.5541	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0667	88.0433	87.9800	87.8440	87.5831	87.3000	87.3000	87.3000	87.3000	87.8482	88.0165	88.0750	(217)
Fuel for water heating, kWh/month													
	230.7375	203.4097	215.2612	188.0683	181.6468	162.9741	160.3261	167.6338	170.4392	190.2649	203.5034	228.0772	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.6689	-46.6234	-76.0694	-96.0528	-108.4699	-106.5774	-104.2960	-96.2187	-80.0178	-59.9748	-37.0314	-27.4950	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.8010	-25.9358	-61.4997	-110.4019	-154.4644	-172.6476	-166.1380	-136.0752	-88.2506	-44.1257	-17.5338	-9.7631	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3661.0239	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2302.3421	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1871.1326	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4723.9439	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3661.0239	7.3200	267.9869	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.3421	7.3200	168.5314	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4956	27.6700	-241.1428	
PV Unit electricity exported	-999.6370	5.8100	-58.0789	
Total			-299.2217	(252)
Total energy cost			420.0909	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3661.0239	0.2100	768.8150	(261)

Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.3421	0.2100	483.4918	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1252.3069	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4956	0.1327	-115.6118	
PV Unit electricity exported	-999.6370	0.1220	-121.9405	
Total			-237.5523	(269)
Total CO2, kg/year			1103.8332	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3661.0239	1.1300	4136.9570	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.3421	1.1300	2601.6466	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6738.6036	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4956	1.4902	-1298.6763	
PV Unit electricity exported	-999.6370	0.4475	-447.3474	
Total			-1746.0237	(283)
Total Primary energy kWh/year			5953.6692	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: A 92
Current environmental impact rating: B 91

N Solar water heating — SAP increase too small
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.4	-£ 34	-146 kg (13.2%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 92
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£175	£175	£0
Mains gas	£545	£545	£0
Space heating	£422	£422	£0
Water heating	£230	£230	£0
Lighting	£67	£67	£0
Generated (PV)	-£299	-£299	£0
Total cost of fuels	£421	£421	£0
Total cost of uses	£420	£420	£0
Delivered energy	35 kWh/m²	35 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	45 kWh/m²	45 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)

Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 344.4138 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2400	(17)
Infiltration rate		0.1620	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1377	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.1756	0.1721	0.1687	0.1515	0.1480	0.1308	0.1308	0.1274	0.1377	0.1480	0.1549	0.1618	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.6438			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0889 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	74.7327 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff													
	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	(39)
Average = Sum(39)m / 12 =												131.5610	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	(40)
HLP (average)												0.9835	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.9041 (42)

Hot water usage for mixer showers
48.6085 47.8780 46.8136 44.7769 43.2739 41.5977 40.6450 41.7014 42.8595 44.6591 46.7396 48.4223 (42a)
Hot water usage for baths
31.4781 31.0106 30.3523 29.1384 28.2295 27.2217 26.6773 27.3310 28.0428 29.1212 30.3601 31.3717 (42b)
Hot water usage for other uses
44.3714 42.7578 41.1443 39.5308 37.9173 36.3038 36.3038 37.9173 39.5308 41.1443 42.7578 44.3714 (42c)
Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month													
	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						221.3981	(64a)
Heat gains from water heating, kWh/month													
	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains													
	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	853.0643	970.0108	1085.4975	1207.4795	1293.5931	1273.9655	1214.5081	1116.9597	1017.8083	904.2670	824.6296	809.8886	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	
alpha	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	
util living area													
	0.9849	0.9741	0.9497	0.8902	0.7741	0.6102	0.4626	0.5182	0.7490	0.9232	0.9754	0.9876	(86)
MIT	19.3772	19.5969	19.9514	20.3817	20.7343	20.9227	20.9797	20.9685	20.8260	20.3621	19.7749	19.3132	(87)
Th 2	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	(88)
util rest of house													
	0.9819	0.9690	0.9394	0.8676	0.7297	0.5393	0.3736	0.4259	0.6854	0.9024	0.9695	0.9850	(89)
MIT 2	18.1931	18.4713	18.9168	19.4442	19.8504	20.0417	20.0873	20.0807	19.9568	19.4320	18.7000	18.1118	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.4267	18.6933	19.1209	19.6291	20.0248	20.2155	20.2634	20.2558	20.1283	19.6155	18.9120	18.3488	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2767	18.5433	18.9709	19.4791	19.8748	20.0655	20.1134	20.1058	19.9783	19.4655	18.7620	18.1988	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9568	0.9230	0.8492	0.7176	0.5367	0.3752	0.4268	0.6760	0.8841	0.9575	0.9773	(94)
Useful gains	830.0704	928.1243	1001.9128	1025.4469	928.3210	683.7177	455.6951	476.7336	688.0678	799.4723	789.5997	791.4943	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1838.7906	1794.9309	1640.6892	1391.7985	1075.4867	719.0424	462.2200	487.5439	773.3577	1166.3535	1534.2711	1841.7010	(97)

Space heating kWh

750.4878	582.4941	475.2497	263.7732	109.4913	0.0000	0.0000	0.0000	0.0000	272.9596	536.1634	781.3537	(98a)

Space heating requirement - total per year (kWh/year) 3771.9727

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

750.4878	582.4941	475.2497	263.7732	109.4913	0.0000	0.0000	0.0000	0.0000	272.9596	536.1634	781.3537	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 3771.9727

Space heating per m2 (98c) / (4) = 28.1974 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 88.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	750.4878	582.4941	475.2497	263.7732	109.4913	0.0000	0.0000	0.0000	0.0000	272.9596	536.1634	781.3537	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	849.9296	659.6762	538.2216	298.7239	123.9992	0.0000	0.0000	0.0000	0.0000	309.1275	607.2066	884.8853	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0850	88.0628	88.0127	87.9122	87.7049	87.3000	87.3000	87.3000	87.3000	87.9175	88.0474	88.0936	(217)
Fuel for water heating, kWh/month													
	230.6895	203.3647	215.1810	187.9225	181.3945	162.9741	160.3261	167.6338	170.4392	190.1149	203.4319	228.0290	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.6129	-44.3078	-73.1106	-92.0921	-106.1341	-101.4830	-99.7591	-90.3295	-74.2126	-54.3294	-31.8608	-23.0689	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.6032	-23.6510	-56.8951	-100.7157	-146.6340	-152.6188	-148.6502	-117.2842	-75.1383	-36.5487	-13.4689	-7.2572	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 4271.7698 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 87.3000

Water heating fuel used 2301.5011 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)

mechanical ventilation fans (SFP = 0.1950) 81.9360 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 167.9360 (231)

Electricity for lighting (calculated in Appendix L) 242.3764 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -1706.7660 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (235)

Appendix Q - special features

Energy saved or generated -0.0000 (236)

Energy used 0.0000 (237)

Total delivered energy for all uses 5498.2154 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4271.7698	3.6400	155.4924	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.5011	3.6400	83.7746	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.3007	16.4900	-134.9378	
PV Unit electricity exported	-888.4653	5.5900	-49.6652	
Total			-184.6030	(252)
Total energy cost			250.8331	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5051	(257)
SAP value		91.8120	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4271.7698	0.2100	897.0717	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.5011	0.2100	483.3152	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1380.3869	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.3007	0.1324	-108.3370	
PV Unit electricity exported	-888.4653	0.1220	-108.4335	
Total			-216.7705	(269)
Total CO2, kg/year			1252.6949	(272)
CO2 emissions per m2			9.3600	(273)
EI value			90.6102	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2400	(17)
Infiltration rate		0.1620	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1377	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1480	0.1411	0.1411	0.1308	0.1343	0.1170	0.1170	0.1136	0.1170	0.1308	0.1274	0.1377	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window			16.2800	1.1450	18.6412			(27)
Window-GF-FF			5.8500	1.1450	6.6985			(27)

Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.6438			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0889 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	74.7327 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	131.5610	(39)
Average = Sum(39)m / 12 =												131.5610	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	0.9835	(40)
HLP (average)												0.9835	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.9041 (42)

Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)		114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	

Distribution loss (46)m = 0.15 x (45)m

29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Total heat required for water heating calculated for each month

224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS -21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)

Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)

Heat gains from water heating, kWh/month

77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568 (72)

Total internal gains

	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	880.4573	980.5819	1100.9378	1241.6296	1318.6356	1343.2233	1272.6765	1181.2951	1068.1552	940.3033	854.9654	833.7390	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	43.8490	
alpha	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	3.9233	
util living area	0.9803	0.9686	0.9370	0.8559	0.7047	0.4909	0.3378	0.3734	0.6630	0.8924	0.9659	0.9835	(86)
MIT	19.5305	19.7286	20.0939	20.5245	20.8368	20.9705	20.9949	20.9926	20.9029	20.5088	19.9422	19.4790	(87)
Th 2	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	20.0971	(88)
util rest of house	0.9762	0.9621	0.9238	0.8265	0.6494	0.4126	0.2470	0.2768	0.5859	0.8632	0.9576	0.9800	(89)
MIT 2	18.3882	18.6381	19.0944	19.6132	19.9582	20.0800	20.0956	20.0947	20.0285	19.6070	18.9111	18.3232	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.6136	18.8533	19.2916	19.7930	20.1315	20.2557	20.2730	20.2718	20.2010	19.7849	19.1146	18.5512	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4636	18.7033	19.1416	19.6430	19.9815	20.1057	20.1230	20.1218	20.0510	19.6349	18.9646	18.4012	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9486	0.9062	0.8094	0.6418	0.4134	0.2497	0.2795	0.5817	0.8450	0.9434	0.9707	(94)
Useful gains	850.3039	930.1779	997.6976	1004.9350	846.2387	555.2312	317.7269	330.1363	621.3341	794.5124	806.5467	809.2944	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1758.1281	1710.7218	1544.7329	1281.7971	931.6530	566.4619	318.7739	331.7759	664.5166	1070.2330	1442.5088	1749.9197	(97)
Space heating kWh	675.4212	524.5255	406.9943	199.3408	63.5482	0.0000	0.0000	0.0000	0.0000	205.1361	457.8927	699.8252	(98a)
Space heating requirement - total per year (kWh/year)												3232.6841	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	675.4212	524.5255	406.9943	199.3408	63.5482	0.0000	0.0000	0.0000	0.0000	205.1361	457.8927	699.8252	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3232.6841	
Space heating per m2											(98c) / (4) =	24.1660	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	675.4212	524.5255	406.9943	199.3408	63.5482	0.0000	0.0000	0.0000	0.0000	205.1361	457.8927	699.8252	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	764.9165	594.0267	460.9221	225.7540	71.9686	0.0000	0.0000	0.0000	0.0000	232.3173	518.5648	792.5541	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0667	88.0433	87.9800	87.8440	87.5831	87.3000	87.3000	87.3000	87.3000	87.8482	88.0165	88.0750	(217)
Fuel for water heating, kWh/month	230.7375	203.4097	215.2612	188.0683	181.6468	162.9741	160.3261	167.6338	170.4392	190.2649	203.5034	228.0772	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.6689	-46.6234	-76.0694	-96.0528	-108.4699	-106.5774	-104.2960	-96.2187	-80.0178	-59.9748	-37.0314	-27.4950	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.8010	-25.9358	-61.4997	-110.4019	-154.4644	-172.6476	-166.1380	-136.0752	-88.2506	-44.1257	-17.5338	-9.7631	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3661.0239	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2302.3421	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1871.1326	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4723.9439	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3661.0239	7.3200	267.9869	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.3421	7.3200	168.5314	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4956	27.6700	-241.1428	
PV Unit electricity exported	-999.6370	5.8100	-58.0789	
Total			-299.2217	(252)
Total energy cost			420.0909	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3661.0239	0.2100	768.8150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.3421	0.2100	483.4918	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1252.3069	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4956	0.1327	-115.6118	
PV Unit electricity exported	-999.6370	0.1220	-121.9405	
Total			-237.5523	(269)
Total CO2, kg/year			1103.8332	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3661.0239	1.1300	4136.9570	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.3421	1.1300	2601.6466	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6738.6036	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.4956	1.4902	-1298.6763	
PV Unit electricity exported	-999.6370	0.4475	-447.3474	
Total			-1746.0237	(283)
Total Primary energy kWh/year			5953.6692	(286)

Summary for Input Data

elmhurst energy

Plot Reference	Plot 53	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	8 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.62	**TER**	10.40
Environmental	91 B	**% DER < TER**			7.50
CO_2 Emissions (t/year)	1.1	**DFEE**	35.56	**TFEE**	37.63
Compliance Check	See BREL	**% DFEE < TFEE**			5.48
% DPER < TPER	4.29	**DPER**	52.03	**TPER**	54.36

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, Semi-Detached	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	1.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	19.44 m	47.23 m²	2.40 m
1st Storey:	18.60 m	43.27 m²	2.67 m
2nd Storey:	18.60 m	43.27 m²	2.67 m

8.0 Living Area 26.39 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.25	60.00	145.98	121.71	0.00	None	24.27	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	75.19	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	76.62
Internal Wall 2	Plasterboard on timber frame	9.00	86.39
Internal Wall 3	Plasterboard on timber frame	9.00	70.08

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof-500mmRoof	External Plane Roof	Plasterboard, insulated at ceiling level	0.08	9.00	32.20	32.20	None	0.00	Enter Gross Area	0.00
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.91	3.91	None	0.00	Enter Gross Area	0.00
Sloping Roof	External Slope Roof	Plasterboard, insulated slope	0.12	9.00	10.21	10.21	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.23
Internal Ceiling 2	+2	Plasterboard ceiling, carpeted chipboard floor	9.00	43.27

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground FLoor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	47.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27
Internal Floor 2	+2	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20
Window-SF	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Window GF-FF	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Front Door	Brickwork	South East	2.15	
Patio Door	Window GF-FF	Brickwork	North West	5.85	
NW	Window-SF	Brickwork	North West	7.16	
SE	Window-SF	Brickwork	South East	9.12	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	11.93	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.30	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	45.31	0.01	0.01	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.44	0.07	0.07	RCD	Yes
E6 Intermediate floor within a dwelling	Gov Approved Scheme	37.22	0.00	0.00	RCD	No
E16 Corner (normal)	Gov Approved Scheme	16.00	0.05	0.05	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	16.00	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.97	0.06	0.06	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	18.28	0.00	0.00		No
P5 Party wall - Roof (insulation at rafter level)	Non Gov Approved Schemes	9.97	0.04	0.04	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.12	0.04	0.04	RCD	No
E15 Flat roof with parapet	Independently assessed	6.41	0.09	0.09	AbbeyCalculated	No
E11 Eaves (insulation at rafter level)	Non Gov Approved Schemes	9.13	0.01	0.01	RCD	No
E13 Gable (insulation at rafter level)	Non Gov Approved Schemes	2.47	0.04	0.04	RCD	No

Y-value	0.00	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500755
Duct Type	Rigid
Wet Rooms	5

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	1
0.15	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0

0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.50	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.96	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
PD	106.00	8.00	848.00	12
DL	106.00	8.00	848.00	26

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	16636	
Fuel Type	Mains gas	
In Winter	0.00	
In Summer	0.00	
Model Name	Logic Code Combi	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	Standard Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

Summary for Input Data

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1
Ensuite 2	Instantaneous electric shower		9.30	No	

28.3 Waste Water Heat Recovery System
Instantaneous System 1

Database ID	80116
Brand Model	Showersave, QB1-21
Details	Year: 2017 + current Efficiency: 69.85 Utilisation factor: 0.973

29.0 Hot Water Cylinder None

32.0 Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
2.35	West	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations
Lower cost measures
None
Further measures to achieve even higher standards
None

Full SAP Calculation Printout

Plot Reference	Plot 53	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	8 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.62	**TER**	10.40
Environmental	91 B	**% DER < TER**			7.50
CO_2 Emissions (t/year)	1.1	**DFEE**	35.56	**TFEE**	37.63
Compliance Check	See BREL	**% DFEE < TFEE**			5.48
% DPER < TPER	4.29	**DPER**	52.03	**TPER**	54.36

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9600	(17)
Infiltration rate		0.1480	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1258	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1604	0.1573	0.1541	0.1384	0.1352	0.1195	0.1195	0.1164	0.1258	0.1352	0.1415	0.1478	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			16.2800	1.1450	18.6412			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.8495			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0889 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 73.9384 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	(39)
Average = Sum(39)m / 12 =												130.7667	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	(40)
HLP (average)												0.9775	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
12Total per year (kWh/year)												2020	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.6460	651.2265	621.8349	600.5850	568.0674	544.1116	521.8038	521.9486	538.9333	560.4304	596.2403	619.0985	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	781.0587	917.2259	1025.3669	1166.9228	1262.9669	1260.6216	1201.5114	1101.6713	998.2034	865.0882	775.5203	743.4971	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	
alpha	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	
util living area	0.9888	0.9783	0.9572	0.8984	0.7823	0.6127	0.4648	0.5220	0.7555	0.9315	0.9797	0.9907	(86)
MIT	19.3092	19.5529	19.9044	20.3604	20.7267	20.9227	20.9797	20.9683	20.8225	20.3362	19.7328	19.2507	(87)
Th 2	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	(88)
util rest of house	0.9864	0.9739	0.9483	0.8770	0.7386	0.5421	0.3758	0.4296	0.6926	0.9125	0.9748	0.9888	(89)
MIT 2	18.1101	18.4195	18.8626	19.4235	19.8472	20.0465	20.0923	20.0855	19.9583	19.4055	18.6507	18.0357	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3467	18.6431	19.0681	19.6083	20.0207	20.2194	20.2673	20.2596	20.1288	19.5891	18.8642	18.2754	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1967	18.4931	18.9181	19.4583	19.8707	20.0694	20.1173	20.1096	19.9788	19.4391	18.7142	18.1254	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9629	0.9329	0.8586	0.7261	0.5394	0.3774	0.4304	0.6829	0.8945	0.9641	0.9825	(94)
Useful gains	764.8337	883.2052	956.5414	1001.9687	917.0900	679.9185	453.4440	474.1947	681.6639	773.8230	747.6685	730.4519	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1817.2215	1777.5225	1623.8796	1380.6772	1068.4563	715.2148	459.9521	485.0961	768.7496	1155.8570	1518.7455	1820.9825	(97)
Space heating kWh	782.9765	600.9812	496.4996	272.6701	112.6165	0.0000	0.0000	0.0000	0.0000	284.2332	555.1754	811.3547	(98a)
Space heating requirement - total per year (kWh/year)												3916.5073	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	782.9765	600.9812	496.4996	272.6701	112.6165	0.0000	0.0000	0.0000	0.0000	284.2332	555.1754	811.3547	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3916.5073	
Space heating per m2											(98c) / (4) =	29.2779	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												88.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	782.9765	600.9812	496.4996	272.6701	112.6165	0.0000	0.0000	0.0000	0.0000	284.2332	555.1754	811.3547	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	886.7231	680.6130	562.2872	308.7997	127.5385	0.0000	0.0000	0.0000	0.0000	321.8949	628.7377	918.8615	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0921	88.0684	88.0216	87.9200	87.7117	87.3000	87.3000	87.3000	87.3000	87.9270	88.0540	88.0997	(217)
Fuel for water heating, kWh/month	230.6710	203.3517	215.1594	187.9057	181.3805	162.9741	160.3261	167.6338	170.4392	190.0943	203.4168	228.0132	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.5631	-44.2341	-73.0008	-91.9700	-106.0083	-101.3682	-99.6457	-90.2189	-74.1111	-54.2441	-31.8052	-23.0267	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.5738	-23.5801	-56.7283	-100.4275	-146.2220	-152.1929	-148.2350	-116.9530	-74.9221	-36.4406	-13.4280	-7.2349	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	4435.4556	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.3657	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1703.1346	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5665.3973	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4435.4556	0.2100	931.4457	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.3657	0.2100	483.2868	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1414.7325	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-817.1962	0.1324	-108.1882	
PV Unit electricity exported	-885.9384	0.1220	-108.1237	
Total			-216.3120	(269)
Total CO2, kg/year			1287.4991	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4435.4556	1.1300	5012.0649	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.3657	1.1300	2600.5432	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7612.6081	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-817.1962	1.4892	-1216.9434	
PV Unit electricity exported	-885.9384	0.4478	-396.7215	
Total			-1613.6650	(283)
Total Primary energy kWh/year			6960.0325	(286)
Dwelling Primary energy Rate (DPER)			52.0300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping Roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	155.2498	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9623	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	75.5931	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff													
	141.3692	141.0217	140.6811	139.0815	138.7822	137.3889	137.3889	137.1309	137.9256	138.7822	139.3876	140.0206	(39)
Average = Sum(39)m / 12 =												139.0800	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0568	1.0542	1.0517	1.0397	1.0375	1.0271	1.0271	1.0251	1.0311	1.0375	1.0420	1.0467	(40)
HLP (average)												1.0397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m													
	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8068	40.9073	41.0064	41.4780	41.5675	41.9890	41.9890	42.0680	41.8256	41.5675	41.3869	41.1998	
alpha	3.7205	3.7272	3.7338	3.7652	3.7712	3.7993	3.7993	3.8045	3.7884	3.7712	3.7591	3.7467	
util living area													
	0.9882	0.9781	0.9583	0.9032	0.7943	0.6272	0.4795	0.5356	0.7661	0.9333	0.9792	0.9901	(86)
MIT	19.1582	19.4096	19.7784	20.2760	20.6751	20.9054	20.9737	20.9603	20.7919	20.2671	19.6325	19.1210	(87)
Th 2	20.0363	20.0384	20.0405	20.0504	20.0522	20.0608	20.0608	20.0624	20.0575	20.0522	20.0485	20.0446	(88)
util rest of house													
	0.9857	0.9735	0.9493	0.8820	0.7503	0.5536	0.3847	0.4382	0.7020	0.9141	0.9741	0.9880	(89)
MIT 2	17.8749	18.1953	18.6623	19.2831	19.7491	19.9930	20.0483	20.0419	19.8891	19.2852	18.4880	17.8329	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.1280	18.4349	18.8825	19.4790	19.9318	20.1730	20.2308	20.2231	20.0672	19.4789	18.7138	18.0870	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1280	18.4349	18.8825	19.4790	19.9318	20.1730	20.2308	20.2231	20.0672	19.4789	18.7138	18.0870	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9630	0.9352	0.8667	0.7440	0.5629	0.4024	0.4557	0.7027	0.8995	0.9640	0.9816	(94)
Useful gains	782.3687	900.9076	975.3844	1025.0990	950.7532	717.3634	488.6931	508.0994	711.2891	791.7645	763.8504	747.7861	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1954.8584	1908.7109	1741.9799	1471.3381	1142.4243	765.6664	498.8374	524.2592	823.0335	1232.2365	1618.8204	1944.4701	(97)
Space heating kWh													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98a)
Space heating requirement - total per year (kWh/year)												4417.4410	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4417.4410	
Space heating per m2											(98c) / (4) =	33.0227	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	944.0826	732.9479	617.2587	347.7188	154.3325	0.0000	0.0000	0.0000	0.0000	354.6658	666.2103	963.5638	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652 (64)

Efficiency of water heater 80.3000 (216)

(217)m	86.8083	86.5960	86.1832	85.2925	83.6328	80.3000	80.3000	80.3000	80.3000	85.3077	86.4209	86.8570 (217)

Fuel for water heating, kWh/month

	291.7108	258.5103	276.0436	245.8655	243.4041	228.8498	226.3471	235.2227	237.6393	248.9202	260.5862	288.4801 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4780.7803 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	3041.5796 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	264.9585 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2334.4611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5838.8574 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4780.7803	0.2100	1003.9639	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3041.5796	0.2100	638.7317	(264)
Space and water heating			1642.6956	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1390.6985	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4780.7803	1.1300	5402.2818	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3041.5796	1.1300	3436.9850	(278)
Space and water heating			8839.2668	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			7272.0954	(286)
Target Primary Energy Rate (TPER)			54.3600	(287)

Full SAP Calculation Printout

Plot Reference	Plot 53	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	8 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.62	**TER**	10.40
Environmental	91 B	**% DER < TER**			7.50
CO_2 Emissions (t/year)	1.1	**DFEE**	35.56	**TFEE**	37.63
Compliance Check	See BREL	**% DFEE < TFEE**			5.48
% DPER < TPER	4.29	**DPER**	52.03	**TPER**	54.36

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9600	(17)
Infiltration rate		0.2641	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2245	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2863	0.2806	0.2750	0.2470	0.2414	0.2133	0.2133	0.2077	0.2245	0.2414	0.2526	0.2638	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5410	0.5394	0.5378	0.5305	0.5291	0.5227	0.5227	0.5216	0.5252	0.5291	0.5319	0.5348	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			16.2800	1.1450	18.6412			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.8495			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)

Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0889 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 73.9384 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.4851	61.3043	61.1270	60.2945	60.1387	59.4136	59.4136	59.2793	59.6929	60.1387	60.4538	60.7833	(38)
Heat transfer coeff	135.4235	135.2427	135.0655	134.2329	134.0772	133.3520	133.3520	133.2178	133.6314	134.0772	134.3923	134.7217	(39)

Average = Sum(39)m / 12 = 134.2322

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0124	1.0110	1.0097	1.0035	1.0023	0.9969	0.9969	0.9959	0.9990	1.0023	1.0047	1.0071	(40)
HLP (average)												1.0035	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)

Energy content (annual) Total = Sum(45)m = 1154.6247
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)

Total per year (kWh/year) = Sum(64)m = 981.4310 (64)
12Total per year (kWh/year) 981 (64)
Electric shower(s)

58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 664.1943 (64a)
Heat gains from water heating, kWh/month

40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.5984	42.6553	42.7113	42.9762	43.0261	43.2601	43.2601	43.3037	43.1697	43.0261	42.9253	42.8203	
alpha	3.8399	3.8437	3.8474	3.8651	3.8684	3.8840	3.8840	3.8869	3.8780	3.8684	3.8617	3.8547	
util living area	0.9912	0.9824	0.9644	0.9110	0.8023	0.6332	0.4836	0.5432	0.7772	0.9422	0.9838	0.9928	(86)
MIT	19.1728	19.4245	19.7921	20.2854	20.6836	20.9090	20.9753	20.9616	20.7936	20.2638	19.6305	19.1261	(87)
Th 2	20.0730	20.0742	20.0753	20.0805	20.0814	20.0859	20.0859	20.0868	20.0842	20.0814	20.0795	20.0774	(88)
util rest of house	0.9894	0.9787	0.9566	0.8914	0.7597	0.5611	0.3905	0.4471	0.7153	0.9254	0.9798	0.9913	(89)
MIT 2	18.3932	18.6435	19.0067	19.4864	19.8497	20.0346	20.0766	20.0710	19.9525	19.4752	18.8535	18.3499	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.5470	18.7976	19.1616	19.6440	20.0143	20.2071	20.2539	20.2467	20.1184	19.6308	19.0068	18.5030	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5470	18.7976	19.1616	19.6440	20.0143	20.2071	20.2539	20.2467	20.1184	19.6308	19.0068	18.5030	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9851	0.9720	0.9469	0.8803	0.7563	0.5712	0.4081	0.4647	0.7179	0.9151	0.9734	0.9876	(94)
Useful gains	717.2747	841.1547	924.1738	988.9428	924.8454	700.9046	477.6631	496.7016	691.5910	753.2976	708.7383	682.7499	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1929.3748	1879.5507	1710.1469	1442.1958	1114.7522	747.7194	487.2527	512.4508	804.2527	1210.8252	1600.1838	1926.9277	(97)
Space heating kWh	901.8025	697.8021	584.7640	326.3422	141.2907	0.0000	0.0000	0.0000	0.0000	340.4005	641.8407	925.6682	(98a)
Space heating requirement - total per year (kWh/year)												4559.9110	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	901.8025	697.8021	584.7640	326.3422	141.2907	0.0000	0.0000	0.0000	0.0000	340.4005	641.8407	925.6682	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4559.9110	
Space heating per m2											(98c) / (4) =	34.0877	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1253.5093	986.8052	1012.4550	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8272	0.8884	0.8527	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1036.9617	876.7068	863.3606	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	235.0432	315.1592	239.1703	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.7608	78.7898	59.7926	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												197.3432	(107)
Energy for space heating												34.0877	(99)
Energy for space cooling												1.4752	(108)
Total												35.5629	(109)
Fabric Energy Efficiency (DFEE)												35.6	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping Roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9623	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	75.5931	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	141.3692	141.0217	140.6811	139.0815	138.7822	137.3889	137.3889	137.1309	137.9256	138.7822	139.3876	140.0206	(39)
Average = Sum(39)m / 12 =												139.0800	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0568	1.0542	1.0517	1.0397	1.0375	1.0271	1.0271	1.0251	1.0311	1.0375	1.0420	1.0467	(40)
HLP (average)												1.0397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
										Total per year (kWh/year) = Sum(64)m =		981.4310	(64)
12Total per year (kWh/year)												981	(64)
Electric shower(s)													
	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		664.1943	(64a)
Heat gains from water heating, kWh/month													
	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains													
	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8068	40.9073	41.0064	41.4780	41.5675	41.9890	41.9890	42.0680	41.8256	41.5675	41.3869	41.1998	
alpha	3.7205	3.7272	3.7338	3.7652	3.7712	3.7993	3.7993	3.8045	3.7884	3.7712	3.7591	3.7467	
util living area													
	0.9913	0.9828	0.9657	0.9150	0.8112	0.6448	0.4953	0.5548	0.7863	0.9445	0.9841	0.9928	(86)
MIT	19.0780	19.3339	19.7115	20.2285	20.6479	20.8960	20.9707	20.9553	20.7707	20.2152	19.5627	19.0412	(87)
Th 2	20.0363	20.0384	20.0405	20.0504	20.0522	20.0608	20.0608	20.0624	20.0575	20.0522	20.0485	20.0446	(88)
util rest of house													
	0.9894	0.9792	0.9581	0.8957	0.7688	0.5709	0.3983	0.4554	0.7241	0.9279	0.9801	0.9912	(89)
MIT 2	18.2724	18.5277	18.9018	19.4089	19.7940	20.0022	20.0498	20.0442	19.9110	19.4064	18.7638	18.2418	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.4314	18.6868	19.0615	19.5706	19.9625	20.1785	20.2315	20.2239	20.0806	19.5660	18.9214	18.3995	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4314	18.6868	19.0615	19.5706	19.9625	20.1785	20.2315	20.2239	20.0806	19.5660	18.9214	18.3995	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9722	0.9481	0.8841	0.7643	0.5808	0.4165	0.4734	0.7259	0.9172	0.9736	0.9875	(94)
Useful gains	717.1990	841.3801	925.3460	993.1161	934.5869	712.6854	487.5187	505.9940	699.2749	755.0671	708.8703	682.6615	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1997.7394	1944.2313	1767.1691	1484.0759	1146.6848	766.4228	498.9257	524.3789	824.8830	1244.3208	1647.7623	1988.2280	(97)
Space heating kWh													
	952.7221	741.1160	626.3164	353.4910	157.8008	0.0000	0.0000	0.0000	0.0000	364.0047	676.0022	971.3415	(98a)
Space heating requirement - total per year (kWh/year)												4842.7947	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	952.7221	741.1160	626.3164	353.4910	157.8008	0.0000	0.0000	0.0000	0.0000	364.0047	676.0022	971.3415	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4842.7947	
Space heating per m2											(98c) / (4) =	36.2024	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Full SAP Calculation Printout

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1291.4559	1016.6781	1042.1950	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8125	0.8764	0.8394	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1049.3516	891.0301	874.7863	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	226.1225	304.5027	230.6695	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	56.5306	76.1257	57.6674	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												190.3237	(107)
Energy for space heating												36.2024	(99)
Energy for space cooling												1.4228	(108)
Total												37.6252	(109)
Fabric Energy Efficiency (TFEE)												37.6	(109)

Full SAP Calculation Printout

Plot Reference	Plot 53	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	8 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.62	**TER**	10.40
Environmental	91 B	**% DER < TER**			7.50
CO_2 Emissions (t/year)	1.1	**DFEE**	35.56	**TFEE**	37.63
Compliance Check	See BREL	**% DFEE < TFEE**			5.48
% DPER < TPER	4.29	**DPER**	52.03	**TPER**	54.36

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9600	(17)
Infiltration rate		0.1480	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1258	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1604	0.1573	0.1541	0.1384	0.1352	0.1195	0.1195	0.1164	0.1258	0.1352	0.1415	0.1478	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			16.2800	1.1450	18.6412			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.8495			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0889 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 73.9384 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	(39)
Average = Sum(39)m / 12 =												130.7667	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	(40)
HLP (average)												0.9775	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
12Total per year (kWh/year)												2020	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.6460	651.2265	621.8349	600.5850	568.0674	544.1116	521.8038	521.9486	538.9333	560.4304	596.2403	619.0985	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	781.0587	917.2259	1025.3669	1166.9228	1262.9669	1260.6216	1201.5114	1101.6713	998.2034	865.0882	775.5203	743.4971	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	
alpha	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	
util living area	0.9888	0.9783	0.9572	0.8984	0.7823	0.6127	0.4648	0.5220	0.7555	0.9315	0.9797	0.9907	(86)
MIT	19.3092	19.5529	19.9044	20.3604	20.7267	20.9227	20.9797	20.9683	20.8225	20.3362	19.7328	19.2507	(87)
Th 2	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	(88)
util rest of house	0.9864	0.9739	0.9483	0.8770	0.7386	0.5421	0.3758	0.4296	0.6926	0.9125	0.9748	0.9888	(89)
MIT 2	18.1101	18.4195	18.8626	19.4235	19.8472	20.0465	20.0923	20.0855	19.9583	19.4055	18.6507	18.0357	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3467	18.6431	19.0681	19.6083	20.0207	20.2194	20.2673	20.2596	20.1288	19.5891	18.8642	18.2754	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1967	18.4931	18.9181	19.4583	19.8707	20.0694	20.1173	20.1096	19.9788	19.4391	18.7142	18.1254	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9629	0.9329	0.8586	0.7261	0.5394	0.3774	0.4304	0.6829	0.8945	0.9641	0.9825	(94)
Useful gains	764.8337	883.2052	956.5414	1001.9687	917.0900	679.9185	453.4440	474.1947	681.6639	773.8230	747.6685	730.4519	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1817.2215	1777.5225	1623.8796	1380.6772	1068.4563	715.2148	459.9521	485.0961	768.7496	1155.8570	1518.7455	1820.9825	(97)
Space heating kWh	782.9765	600.9812	496.4996	272.6701	112.6165	0.0000	0.0000	0.0000	0.0000	284.2332	555.1754	811.3547	(98a)
Space heating requirement - total per year (kWh/year)												3916.5073	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	782.9765	600.9812	496.4996	272.6701	112.6165	0.0000	0.0000	0.0000	0.0000	284.2332	555.1754	811.3547	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3916.5073	
Space heating per m2											(98c) / (4) =	29.2779	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												88.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	782.9765	600.9812	496.4996	272.6701	112.6165	0.0000	0.0000	0.0000	0.0000	284.2332	555.1754	811.3547	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	886.7231	680.6130	562.2872	308.7997	127.5385	0.0000	0.0000	0.0000	0.0000	321.8949	628.7377	918.8615	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0921	88.0684	88.0216	87.9200	87.7117	87.3000	87.3000	87.3000	87.3000	87.9270	88.0540	88.0997	(217)
Fuel for water heating, kWh/month	230.6710	203.3517	215.1594	187.9057	181.3805	162.9741	160.3261	167.6338	170.4392	190.0943	203.4168	228.0132	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.5631	-44.2341	-73.0008	-91.9700	-106.0083	-101.3682	-99.6457	-90.2189	-74.1111	-54.2441	-31.8052	-23.0267	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.5738	-23.5801	-56.7283	-100.4275	-146.2220	-152.1929	-148.2350	-116.9530	-74.9221	-36.4406	-13.4280	-7.2349	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	4435.4556	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.3657	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1703.1346	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5665.3973	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4435.4556	0.2100	931.4457	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.3657	0.2100	483.2868	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1414.7325	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-817.1962	0.1324	-108.1882	
PV Unit electricity exported	-885.9384	0.1220	-108.1237	
Total			-216.3120	(269)
Total CO2, kg/year			1287.4991	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4435.4556	1.1300	5012.0649	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.3657	1.1300	2600.5432	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7612.6081	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-817.1962	1.4892	-1216.9434	
PV Unit electricity exported	-885.9384	0.4478	-396.7215	
Total			-1613.6650	(283)
Total Primary energy kWh/year			6960.0325	(286)
Dwelling Primary energy Rate (DPER)			52.0300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping Roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	155.2498	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.9623	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	75.5931	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff													
	141.3692	141.0217	140.6811	139.0815	138.7822	137.3889	137.3889	137.1309	137.9256	138.7822	139.3876	140.0206	(39)
Average = Sum(39)m / 12 =												139.0800	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0568	1.0542	1.0517	1.0397	1.0375	1.0271	1.0271	1.0251	1.0311	1.0375	1.0420	1.0467	(40)
HLP (average)												1.0397	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m													
	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8068	40.9073	41.0064	41.4780	41.5675	41.9890	41.9890	42.0680	41.8256	41.5675	41.3869	41.1998	
alpha	3.7205	3.7272	3.7338	3.7652	3.7712	3.7993	3.7993	3.8045	3.7884	3.7712	3.7591	3.7467	
util living area													
	0.9882	0.9781	0.9583	0.9032	0.7943	0.6272	0.4795	0.5356	0.7661	0.9333	0.9792	0.9901	(86)
MIT	19.1582	19.4096	19.7784	20.2760	20.6751	20.9054	20.9737	20.9603	20.7919	20.2671	19.6325	19.1210	(87)
Th 2	20.0363	20.0384	20.0405	20.0504	20.0522	20.0608	20.0608	20.0624	20.0575	20.0522	20.0485	20.0446	(88)
util rest of house													
	0.9857	0.9735	0.9493	0.8820	0.7503	0.5536	0.3847	0.4382	0.7020	0.9141	0.9741	0.9880	(89)
MIT 2	17.8749	18.1953	18.6623	19.2831	19.7491	19.9930	20.0483	20.0419	19.8891	19.2852	18.4880	17.8329	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.1280	18.4349	18.8825	19.4790	19.9318	20.1730	20.2308	20.2231	20.0672	19.4789	18.7138	18.0870	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1280	18.4349	18.8825	19.4790	19.9318	20.1730	20.2308	20.2231	20.0672	19.4789	18.7138	18.0870	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9630	0.9352	0.8667	0.7440	0.5629	0.4024	0.4557	0.7027	0.8995	0.9640	0.9816	(94)
Useful gains	782.3687	900.9076	975.3844	1025.0990	950.7532	717.3634	488.6931	508.0994	711.2891	791.7645	763.8504	747.7861	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1954.8584	1908.7109	1741.9799	1471.3381	1142.4243	765.6664	498.8374	524.2592	823.0335	1232.2365	1618.8204	1944.4701	(97)
Space heating kWh													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98a)
Space heating requirement - total per year (kWh/year)												4417.4410	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4417.4410	
Space heating per m2											(98c) / (4) =	33.0227	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	872.3323	677.2438	570.3471	321.2921	142.6032	0.0000	0.0000	0.0000	0.0000	327.7112	615.5783	890.3329	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	944.0826	732.9479	617.2587	347.7188	154.3325	0.0000	0.0000	0.0000	0.0000	354.6658	666.2103	963.5638	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652 (64)

Efficiency of water heater 80.3000 (216)

(217)m	86.8083	86.5960	86.1832	85.2925	83.6328	80.3000	80.3000	80.3000	80.3000	85.3077	86.4209	86.8570 (217)

Fuel for water heating, kWh/month

	291.7108	258.5103	276.0436	245.8655	243.4041	228.8498	226.3471	235.2227	237.6393	248.9202	260.5862	288.4801 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4780.7803 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	3041.5796 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	264.9585 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2334.4611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5838.8574 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4780.7803	0.2100	1003.9639	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3041.5796	0.2100	638.7317	(264)
Space and water heating			1642.6956	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1390.6985	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4780.7803	1.1300	5402.2818	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3041.5796	1.1300	3436.9850	(278)
Space and water heating			8839.2668	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			7272.0954	(286)
Target Primary Energy Rate (TPER)			54.3600	(287)

Full SAP Calculation Printout

Plot Reference	Plot 53	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	8 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	92 A	**DER**	9.62	**TER**	10.40
Environmental	91 B	**% DER < TER**			7.50
CO_2 Emissions (t/year)	1.1	**DFEE**	35.56	**TFEE**	37.63
Compliance Check	See BREL	**% DFEE < TFEE**			5.48
% DPER < TPER	4.29	**DPER**	52.03	**TPER**	54.36

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9600	(17)
Infiltration rate		0.1480	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1258	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1604	0.1573	0.1541	0.1384	0.1352	0.1195	0.1195	0.1164	0.1258	0.1352	0.1415	0.1478	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			16.2800	1.1450	18.6412			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	67.8495			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0889 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 73.9384 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	(39)
Average = Sum(39)m / 12 =												130.7667	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	(40)
HLP (average)												0.9775	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	853.0643	970.0108	1085.4975	1207.4795	1293.5931	1273.9655	1214.5081	1116.9597	1017.8083	904.2670	824.6296	809.8886	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	
alpha	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	
util living area	0.9849	0.9740	0.9493	0.8893	0.7723	0.6077	0.4603	0.5158	0.7470	0.9226	0.9753	0.9875	(86)
MIT	19.3905	19.6098	19.9631	20.3908	20.7399	20.9249	20.9804	20.9696	20.8299	20.3703	19.7860	19.3265	(87)
Th 2	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	(88)
util rest of house	0.9818	0.9688	0.9390	0.8666	0.7279	0.5373	0.3720	0.4242	0.6835	0.9018	0.9694	0.9850	(89)
MIT 2	18.2132	18.4909	18.9348	19.4589	19.8606	20.0482	20.0926	20.0862	19.9650	19.4455	18.7174	18.1319	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.4455	18.7117	19.1377	19.6427	20.0341	20.2212	20.2678	20.2605	20.1356	19.6280	18.9282	18.3676	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2955	18.5617	18.9877	19.4927	19.8841	20.0712	20.1178	20.1105	19.9856	19.4780	18.7782	18.2176	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9567	0.9227	0.8484	0.7160	0.5347	0.3736	0.4251	0.6743	0.8835	0.9574	0.9773	(94)
Useful gains	830.0457	928.0107	1001.5453	1024.4105	926.2266	681.1905	453.7265	474.7715	686.3246	798.9398	789.5111	791.4863	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1830.1405	1786.4918	1632.9731	1385.1780	1070.2090	715.4494	460.0063	485.2058	769.6414	1160.9436	1527.1217	1833.0356	(97)
Space heating kWh	744.0705	576.8993	469.7823	259.7526	107.1230	0.0000	0.0000	0.0000	0.0000	269.3309	531.0796	774.9127	(98a)
Space heating requirement - total per year (kWh/year)												3732.9507	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	744.0705	576.8993	469.7823	259.7526	107.1230	0.0000	0.0000	0.0000	0.0000	269.3309	531.0796	774.9127	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3732.9507	
Space heating per m2											(98c) / (4) =	27.9057	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	744.0705	576.8993	469.7823	259.7526	107.1230	0.0000	0.0000	0.0000	0.0000	269.3309	531.0796	774.9127	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	842.6620	653.3401	532.0297	294.1705	121.3170	0.0000	0.0000	0.0000	0.0000	305.0180	601.4492	877.5908	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0836	88.0610	88.0104	87.9085	87.6997	87.3000	87.3000	87.3000	87.3000	87.9144	88.0456	88.0923	(217)
Fuel for water heating, kWh/month	230.6933	203.3687	215.1868	187.9303	181.4054	162.9741	160.3261	167.6338	170.4392	190.1218	203.4361	228.0325	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.5631	-44.2341	-73.0008	-91.9700	-106.0083	-101.3682	-99.6457	-90.2189	-74.1111	-54.2441	-31.8052	-23.0267	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.5738	-23.5801	-56.7283	-100.4275	-146.2220	-152.1929	-148.2350	-116.9530	-74.9221	-36.4406	-13.4280	-7.2349	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4227.5773	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.5480	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1703.1346	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5457.7012	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4227.5773	3.6400	153.8838	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.5480	3.6400	83.7763	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-817.1962	16.4900	-134.7556	
PV Unit electricity exported	-885.9384	5.5900	-49.5240	
Total			-184.2796	(252)
Total energy cost			249.5496	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5025	(257)
SAP value		91.8539	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4227.5773	0.2100	887.7912	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.5480	0.2100	483.3251	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1371.1163	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-817.1962	0.1324	-108.1882	
PV Unit electricity exported	-885.9384	0.1220	-108.1237	
Total			-216.3120	(269)
Total CO2, kg/year			1243.8829	(272)
CO2 emissions per m2			9.3000	(273)
EI value			90.6763	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9600	(17)
Infiltration rate		0.1480	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1258	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1352	0.1289	0.1289	0.1195	0.1227	0.1069	0.1069	0.1038	0.1069	0.1195	0.1164	0.1258	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			16.2800	1.1450	18.6412			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.8495			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0889 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	73.9384 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	(39)
Average = Sum(39)m / 12 =												130.7667	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	(40)
HLP (average)												0.9775	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	880.4573	980.5819	1100.9378	1241.6296	1318.6356	1343.2233	1272.6765	1181.2951	1068.1552	940.3033	854.9654	833.7390	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	
alpha	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	
util living area	0.9802	0.9684	0.9365	0.8547	0.7025	0.4885	0.3359	0.3713	0.6606	0.8915	0.9657	0.9835	(86)
MIT	19.5432	19.7408	20.1047	20.5325	20.8408	20.9715	20.9952	20.9929	20.9054	20.5160	19.9527	19.4916	(87)
Th 2	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	(88)
util rest of house	0.9761	0.9619	0.9233	0.8252	0.6474	0.4108	0.2461	0.2757	0.5839	0.8622	0.9574	0.9800	(89)
MIT 2	18.4076	18.6570	19.1113	19.6264	19.9666	20.0856	20.1006	20.0998	20.0353	19.6192	18.9277	18.3425	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6317	18.8708	19.3073	19.8051	20.1391	20.2604	20.2771	20.2760	20.2070	19.7961	19.1299	18.5692	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4817	18.7208	19.1573	19.6551	19.9891	20.1104	20.1271	20.1260	20.0570	19.6461	18.9799	18.4192	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9657	0.9484	0.9058	0.8082	0.6399	0.4116	0.2486	0.2783	0.5798	0.8441	0.9432	0.9706	(94)
Useful gains	850.2465	930.0146	997.1967	1003.5423	843.7568	552.8273	316.3818	328.7410	619.2920	793.7096	806.3820	809.2616	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1749.8756	1702.6924	1537.4654	1275.6448	927.0119	563.6515	317.3829	330.3120	661.2835	1065.2423	1435.8029	1741.7087	(97)
Space heating kWh	669.3240	519.2395	401.9600	195.9138	61.9418	0.0000	0.0000	0.0000	0.0000	202.0203	453.1830	693.7407	(98a)
Space heating requirement - total per year (kWh/year)												3197.3232	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													

	669.3240	519.2395	401.9600	195.9138	61.9418	0.0000	0.0000	0.0000	202.0203	453.1830	693.7407	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)											3197.3232	
Space heating per m2										(98c) / (4) =	23.9016	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)											0.0000	(201)
Fraction of space heat from main system(s)											1.0000	(202)
Efficiency of main space heating system 1 (in %)											88.3000	(206)
Efficiency of main space heating system 2 (in %)											0.0000	(207)
Efficiency of secondary/supplementary heating system, %											0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	669.3240	519.2395	401.9600	195.9138	61.9418	0.0000	0.0000	0.0000	0.0000	202.0203	453.1830	693.7407	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	758.0114	588.0402	455.2208	221.8730	70.1493	0.0000	0.0000	0.0000	0.0000	228.7885	513.2311	785.6633	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0651	88.0414	87.9773	87.8397	87.5779	87.3000	87.3000	87.3000	87.3000	87.8444	88.0144	88.0735	(217)
Fuel for water heating, kWh/month													
	230.7417	203.4141	215.2678	188.0776	181.6575	162.9741	160.3261	167.6338	170.4392	190.2732	203.5083	228.0811	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.6111	-46.5466	-75.9565	-95.9282	-108.3434	-106.4621	-104.1821	-96.1061	-79.9121	-59.8831	-36.9682	-27.4456	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.7620	-25.8582	-61.3199	-110.0872	-154.0315	-172.1688	-165.6766	-135.6936	-87.9983	-43.9959	-17.4810	-9.7332	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3620.9775	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2302.3945	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)													
mechanical ventilation fans (SFP = 0.1950)												81.9360	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												167.9360	(231)
Electricity for lighting (calculated in Appendix L)												242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1867.1515	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4687.9310	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3620.9775	7.3200	265.0556	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.3945	7.3200	168.5353	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-870.3452	27.6700	-240.8245	
PV Unit electricity exported	-996.8063	5.8100	-57.9144	
Total			-298.7390	(252)
Total energy cost			417.6462	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3620.9775	0.2100	760.4053	(261)

Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.3945	0.2100	483.5028	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1243.9081	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-870.3452	0.1327	-115.4562	
PV Unit electricity exported	-996.8063	0.1220	-121.5934	
Total			-237.0497	(269)
Total CO2, kg/year			1095.9370	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3620.9775	1.1300	4091.7046	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.3945	1.1300	2601.7058	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6693.4104	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-870.3452	1.4902	-1296.9510	
PV Unit electricity exported	-996.8063	0.4475	-446.0742	
Total			-1743.0252	(283)
Total Primary energy kWh/year			5911.4745	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: A 92
Current environmental impact rating: B 91

N Solar water heating	SAP increase too small
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.4	-£ 34	-146 kg (13.3%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 92
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£175	£175	£0
Mains gas	£542	£542	£0
Space heating	£420	£420	£0
Water heating	£230	£230	£0
Lighting	£67	£67	£0
Generated (PV)	-£299	-£299	£0
Total cost of fuels	£418	£418	£0
Total cost of uses	£418	£418	£0
Delivered energy	35 kWh/m²	35 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	44 kWh/m²	44 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)

Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 344.4138 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9600	(17)
Infiltration rate		0.1480	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1258	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1604	0.1573	0.1541	0.1384	0.1352	0.1195	0.1195	0.1164	0.1258	0.1352	0.1415	0.1478	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			16.2800	1.1450	18.6412			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.8495			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0889 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	73.9384 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	(39)
Average = Sum(39)m / 12 =												130.7667	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	(40)
HLP (average)												0.9775	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.9041 (42)

Hot water usage for mixer showers
48.6085 47.8780 46.8136 44.7769 43.2739 41.5977 40.6450 41.7014 42.8595 44.6591 46.7396 48.4223 (42a)
Hot water usage for baths
31.4781 31.0106 30.3523 29.1384 28.2295 27.2217 26.6773 27.3310 28.0428 29.1212 30.3601 31.3717 (42b)
Hot water usage for other uses
44.3714 42.7578 41.1443 39.5308 37.9173 36.3038 36.3038 37.9173 39.5308 41.1443 42.7578 44.3714 (42c)
Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892
Distribution loss (46)m = 0.15 x (45)m
29.5667 25.9835 27.2758 23.2953 22.0952 19.3892 18.7990 19.8639 20.4263 23.3928 25.6138 29.1619 (46)
Water storage loss (or HIU loss):
Total storage loss
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
If cylinder contains dedicated solar storage
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Total heat required for water heating calculated for each month
224.6071 198.0187 209.2092 181.6205 174.3890 155.3662 152.2343 159.3918 162.3366 183.1103 197.2041 221.8868 (62)

WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h
203.2029 179.0886 189.3867 165.2067 159.0919 142.2764 139.9647 146.3443 148.7934 167.1443 179.1166 200.8790 (64)
Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)
Electric shower(s)
19.4637 17.3423 18.9371 18.0715 18.4106 17.5619 18.1473 18.4106 18.0715 18.9371 18.5810 19.4637 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month
77.2794 68.1311 72.0382 62.7354 60.3523 53.8961 52.9349 55.3758 56.3365 63.3779 68.0339 76.3767 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
34.3109 30.4746 24.7836 18.7628 14.0254 11.8408 12.7945 16.6307 22.3217 28.3425 33.0799 35.2645 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
451.0587 455.7392 443.9443 418.8344 387.1376 357.3470 337.4451 332.7646 344.5595 369.6694 401.3662 431.1568 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 55.3290 (69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)
-116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 -116.1658 (71)
Water heating gains (Table 5)
103.8701 101.3856 96.8256 87.1325 81.1186 74.8557 71.1490 74.4298 78.2451 85.1853 94.4915 102.6568 (72)
Total internal gains
705.6516 704.0114 681.9655 641.1417 598.6935 557.4555 534.8005 537.2370 558.5382 599.6092 645.3496 685.4900 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	853.0643	970.0108	1085.4975	1207.4795	1293.5931	1273.9655	1214.5081	1116.9597	1017.8083	904.2670	824.6296	809.8886	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	
alpha	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	
util living area	0.9849	0.9740	0.9493	0.8893	0.7723	0.6077	0.4603	0.5158	0.7470	0.9226	0.9753	0.9875	(86)
MIT	19.3905	19.6098	19.9631	20.3908	20.7399	20.9249	20.9804	20.9696	20.8299	20.3703	19.7860	19.3265	(87)
Th 2	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	(88)
util rest of house	0.9818	0.9688	0.9390	0.8666	0.7279	0.5373	0.3720	0.4242	0.6835	0.9018	0.9694	0.9850	(89)
MIT 2	18.2132	18.4909	18.9348	19.4589	19.8606	20.0482	20.0926	20.0862	19.9650	19.4455	18.7174	18.1319	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.4455	18.7117	19.1377	19.6427	20.0341	20.2212	20.2678	20.2605	20.1356	19.6280	18.9282	18.3676	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2955	18.5617	18.9877	19.4927	19.8841	20.0712	20.1178	20.1105	19.9856	19.4780	18.7782	18.2176	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9567	0.9227	0.8484	0.7160	0.5347	0.3736	0.4251	0.6743	0.8835	0.9574	0.9773	(94)
Useful gains	830.0457	928.0107	1001.5453	1024.4105	926.2266	681.1905	453.7265	474.7715	686.3246	798.9398	789.5111	791.4863	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1830.1405	1786.4918	1632.9731	1385.1780	1070.2090	715.4494	460.0063	485.2058	769.6414	1160.9436	1527.1217	1833.0356	(97)

Space heating kWh

744.0705	576.8993	469.7823	259.7526	107.1230	0.0000	0.0000	0.0000	0.0000	269.3309	531.0796	774.9127	(98a)

Space heating requirement - total per year (kWh/year) 3732.9507

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

744.0705	576.8993	469.7823	259.7526	107.1230	0.0000	0.0000	0.0000	0.0000	269.3309	531.0796	774.9127	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 3732.9507

Space heating per m2 (98c) / (4) = 27.9057 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 88.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	744.0705	576.8993	469.7823	259.7526	107.1230	0.0000	0.0000	0.0000	0.0000	269.3309	531.0796	774.9127	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	842.6620	653.3401	532.0297	294.1705	121.3170	0.0000	0.0000	0.0000	0.0000	305.0180	601.4492	877.5908	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0836	88.0610	88.0104	87.9085	87.6997	87.3000	87.3000	87.3000	87.3000	87.9144	88.0456	88.0923	(217)
Fuel for water heating, kWh/month													
	230.6933	203.3687	215.1868	187.9303	181.4054	162.9741	160.3261	167.6338	170.4392	190.1218	203.4361	228.0325	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-27.5631	-44.2341	-73.0008	-91.9700	-106.0083	-101.3682	-99.6457	-90.2189	-74.1111	-54.2441	-31.8052	-23.0267	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-9.5738	-23.5801	-56.7283	-100.4275	-146.2220	-152.1929	-148.2350	-116.9530	-74.9221	-36.4406	-13.4280	-7.2349	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 4227.5773 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 87.3000
Water heating fuel used 2301.5480 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)
mechanical ventilation fans (SFP = 0.1950) 81.9360 (230a)
central heating pump 41.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 167.9360 (231)
Electricity for lighting (calculated in Appendix L) 242.3764 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -1703.1346 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 5457.7012 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4227.5773	3.6400	153.8838	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.5480	3.6400	83.7763	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-817.1962	16.4900	-134.7556	
PV Unit electricity exported	-885.9384	5.5900	-49.5240	
Total			-184.2796	(252)
Total energy cost			249.5496	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5025	(257)
SAP value		91.8539	
SAP rating (Section 12)		92	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4227.5773	0.2100	887.7912	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.5480	0.2100	483.3251	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1371.1163	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-817.1962	0.1324	-108.1882	
PV Unit electricity exported	-885.9384	0.1220	-108.1237	
Total			-216.3120	(269)
Total CO2, kg/year			1243.8829	(272)
CO2 emissions per m2			9.3000	(273)
EI value			90.6763	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.9600	(17)
Infiltration rate		0.1480	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1258	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1352	0.1289	0.1289	0.1195	0.1227	0.1069	0.1069	0.1038	0.1069	0.1195	0.1164	0.1258	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			16.2800	1.1450	18.6412			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)

Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000 (28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005 (29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000 (30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900 (30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900 (30)
Total net area of external elements Aum(A, m2)			239.5300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.8495		(33)
Main dwelling							
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501 (32)
Internal Wall 1			76.6200			9.0000	689.5800 (32c)
Internal Wall 2			86.3900			9.0000	777.5100 (32c)
Internal Wall 3			70.0800			9.0000	630.7200 (32c)
Internal Floor 1			43.2700			18.0000	778.8600 (32d)
Internal Floor 2			43.2700			18.0000	778.8600 (32d)
Internal Ceiling 1			47.2300			9.0000	425.0700 (32e)
Internal Ceiling 2			43.2700			9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0889 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	73.9384 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	130.7667	(39)
Average = Sum(39)m / 12 =												130.7667	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	0.9775	(40)
HLP (average)												0.9775	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9041	(42)
Hot water usage for mixer showers	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)
Average daily hot water use (litres/day)												114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568 (72)

Total internal gains

	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	880.4573	980.5819	1100.9378	1241.6296	1318.6356	1343.2233	1272.6765	1181.2951	1068.1552	940.3033	854.9654	833.7390	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	44.1154	
alpha	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	3.9410	
util living area	0.9802	0.9684	0.9365	0.8547	0.7025	0.4885	0.3359	0.3713	0.6606	0.8915	0.9657	0.9835	(86)
MIT	19.5432	19.7408	20.1047	20.5325	20.8408	20.9715	20.9952	20.9929	20.9054	20.5160	19.9527	19.4916	(87)
Th 2	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	20.1021	(88)
util rest of house	0.9761	0.9619	0.9233	0.8252	0.6474	0.4108	0.2461	0.2757	0.5839	0.8622	0.9574	0.9800	(89)
MIT 2	18.4076	18.6570	19.1113	19.6264	19.9666	20.0856	20.1006	20.0998	20.0353	19.6192	18.9277	18.3425	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6317	18.8708	19.3073	19.8051	20.1391	20.2604	20.2771	20.2760	20.2070	19.7961	19.1299	18.5692	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4817	18.7208	19.1573	19.6551	19.9891	20.1104	20.1271	20.1260	20.0570	19.6461	18.9799	18.4192	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9657	0.9484	0.9058	0.8082	0.6399	0.4116	0.2486	0.2783	0.5798	0.8441	0.9432	0.9706	(94)
Useful gains	850.2465	930.0146	997.1967	1003.5423	843.7568	552.8273	316.3818	328.7410	619.2920	793.7096	806.3820	809.2616	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1749.8756	1702.6924	1537.4654	1275.6448	927.0119	563.6515	317.3829	330.3120	661.2835	1065.2423	1435.8029	1741.7087	(97)
Space heating kWh	669.3240	519.2395	401.9600	195.9138	61.9418	0.0000	0.0000	0.0000	0.0000	202.0203	453.1830	693.7407	(98a)
Space heating requirement - total per year (kWh/year)												3197.3232	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	669.3240	519.2395	401.9600	195.9138	61.9418	0.0000	0.0000	0.0000	0.0000	202.0203	453.1830	693.7407	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3197.3232	
Space heating per m2										(98c) / (4) =		23.9016	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 88.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	669.3240	519.2395	401.9600	195.9138	61.9418	0.0000	0.0000	0.0000	0.0000	202.0203	453.1830	693.7407	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	758.0114	588.0402	455.2208	221.8730	70.1493	0.0000	0.0000	0.0000	0.0000	228.7885	513.2311	785.6633	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0651	88.0414	87.9773	87.8397	87.5779	87.3000	87.3000	87.3000	87.3000	87.8444	88.0144	88.0735	(217)
Fuel for water heating, kWh/month	230.7417	203.4141	215.2678	188.0776	181.6575	162.9741	160.3261	167.6338	170.4392	190.2732	203.5083	228.0811	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.6111	-46.5466	-75.9565	-95.9282	-108.3434	-106.4621	-104.1821	-96.1061	-79.9121	-59.8831	-36.9682	-27.4456	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-12.7620	-25.8582	-61.3199	-110.0872	-154.0315	-172.1688	-165.6766	-135.6936	-87.9983	-43.9959	-17.4810	-9.7332	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3620.9775	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2302.3945	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1867.1515	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4687.9310	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3620.9775	7.3200	265.0556	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.3945	7.3200	168.5353	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-870.3452	27.6700	-240.8245	
PV Unit electricity exported	-996.8063	5.8100	-57.9144	
Total			-298.7390	(252)
Total energy cost			417.6462	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3620.9775	0.2100	760.4053	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.3945	0.2100	483.5028	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1243.9081	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-870.3452	0.1327	-115.4562	
PV Unit electricity exported	-996.8063	0.1220	-121.5934	
Total			-237.0497	(269)
Total CO2, kg/year			1095.9370	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3620.9775	1.1300	4091.7046	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.3945	1.1300	2601.7058	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6693.4104	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-870.3452	1.4902	-1296.9510	
PV Unit electricity exported	-996.8063	0.4475	-446.0742	
Total			-1743.0252	(283)
Total Primary energy kWh/year			5911.4745	(286)

Summary for Input Data

Plot Reference	Plot 54	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	10 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	91 B	**DER**	9.66	**TER**	10.15
Environmental	91 B	**% DER < TER**			4.83
CO_2 Emissions (t/year)	1.11	**DFEE**	33.51	**TFEE**	36.24
Compliance Check	See BREL	**% DFEE < TFEE**			7.54
% DPER < TPER	0.63	**DPER**	52.72	**TPER**	53.05

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, Semi-Detached	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	156.52	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	19.44 m	47.23 m²	2.40 m
1st Storey:	18.60 m	43.27 m²	2.67 m
2nd Storey:	18.60 m	43.27 m²	2.67 m

8.0 Living Area	26.39	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.25	60.00	145.98	124.55	0.00	None	21.43	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	75.19	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	76.62
Internal Wall 2	Plasterboard on timber frame	9.00	86.39
Internal Wall 3	Plasterboard on timber frame	9.00	70.08

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof-500mmRoof	External Plane Roof	Plasterboard, insulated at ceiling level	0.00	9.00	32.20	32.20	None	0.00	Enter Gross Area	0.00
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.91	3.91	None	0.00	Enter Gross Area	0.00
Sloping Roof	External Slope Roof	Plasterboard, insulated slope	0.12	9.00	10.21	10.21	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.23
Internal Ceiling 2	+2	Plasterboard ceiling, carpeted chipboard floor	9.00	43.27

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground FLoor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	47.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27
Internal Floor 2	+2	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20
Window-SF	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Window GF-FF	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Front Door	Brickwork	South East	2.15	
Patio Door	Window GF-FF	Brickwork	North West	5.85	
NW	Window-SF	Brickwork	North West	2.08	
SE	Window-SF	Brickwork	South East	9.12	
SW	Window-SF	Brickwork	South West	2.24	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	10.56	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.30	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	41.24	0.01	0.01	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.44	0.07	0.07	RCD	Yes
E6 Intermediate floor within a dwelling	Gov Approved Scheme	37.22	0.00	0.00	RCD	No
E16 Corner (normal)	Gov Approved Scheme	16.00	0.05	0.05	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	16.00	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.97	0.06	0.06	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	18.28	0.00	0.00		No
P5 Party wall - Roof (insulation at rafter level)	Non Gov Approved Schemes	9.97	0.04	0.04	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.12	0.04	0.04	RCD	No
E15 Flat roof with parapet	Independently assessed	6.41	0.09	0.09	AbbeyCalculated	No
E11 Eaves (insulation at rafter level)	Non Gov Approved Schemes	9.13	0.01	0.01	RCD	No
E13 Gable (insulation at rafter level)	Non Gov Approved Schemes	2.47	0.04	0.04	RCD	No

Y-value	0.03	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500755
Duct Type	Rigid
Wet Rooms	5

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	1
0.15	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0

0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.50	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.32	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
PD	106.00	8.00	848.00	12
DL	106.00	8.00	848.00	26

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	16636	
Fuel Type	Mains gas	
In Winter	88.30	
In Summer	87.30	
Model Name	Logic Code Combi	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	Standard Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

Summary for Input Data

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1
Ensuite 2	Instantaneous electric shower		9.30	No	

28.3 Waste Water Heat Recovery System
Instantaneous System 1

Database ID	80116
Brand Model	Showersave, QB1-21
Details	Year: 2017 + current Efficiency: 69.85 Utilisation factor: 0.973

29.0 Hot Water Cylinder None

32.0 Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
1.62	West	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations
Lower cost measures
None
Further measures to achieve even higher standards
None

Full SAP Calculation Printout

Plot Reference	Plot 54	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	10 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	91 B	**DER**	9.66	**TER**	10.15
Environmental	91 B	**% DER < TER**			4.83
CO_2 Emissions (t/year)	1.11	**DFEE**	33.51	**TFEE**	36.24
Compliance Check	See BREL	**% DFEE < TFEE**			7.54
% DPER < TPER	0.63	**DPER**	52.72	**TPER**	53.05

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.3200 (17)
Infiltration rate			0.1660 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1411 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1799	0.1764	0.1728	0.1552	0.1517	0.1340	0.1340	0.1305	0.1411	0.1517	0.1587	0.1658	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			13.4400	1.1450	15.3893			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	21.4400	124.5400	0.2500	31.1350	60.0000	7472.4005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.7316			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20938.1606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 156.5236 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.5600	0.0500	0.5280
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	41.2400	0.0130	0.5361
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9675 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 68.6991 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	(39)
Average = Sum(39)m / 12 =												125.5274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	(40)
HLP (average)												0.9384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
12Total per year (kWh/year)												2020	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.4868	179.8962	162.4868	167.9031	162.4868	167.9031	162.4868	162.4868	167.9031	162.4868	167.9031	162.4868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	638.1284	656.1893	626.3173	605.2168	572.5498	548.7434	526.2863	526.4311	543.5652	564.9129	600.8722	623.5809	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Southwest	2.2400	36.7938	0.6300	0.7000	0.7700	25.1881	(79)
Northwest	2.0800	11.2829	0.6300	0.7000	0.7700	7.1723	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	155.0838	273.2478	397.9948	533.5724	634.5551	646.2016	616.2510	538.4312	444.5552	308.5018	187.4087	131.6491	(83)
Total gains	793.2123	929.4371	1024.3121	1138.7893	1207.1050	1194.9451	1142.5372	1064.8623	988.1204	873.4147	788.2809	755.2301	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	
alpha	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	
util living area	0.9882	0.9770	0.9560	0.8998	0.7898	0.6222	0.4703	0.5210	0.7473	0.9265	0.9783	0.9903	(86)
MIT	19.4205	19.6606	19.9880	20.4052	20.7425	20.9280	20.9820	20.9727	20.8463	20.4028	19.8283	19.3621	(87)
Th 2	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	(88)
util rest of house	0.9858	0.9724	0.9469	0.8789	0.7476	0.5531	0.3834	0.4315	0.6852	0.9067	0.9732	0.9883	(89)
MIT 2	18.2730	18.5774	18.9897	19.5028	19.8935	20.0828	20.1262	20.1206	20.0108	19.5096	18.7929	18.1987	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.4994	18.7911	19.1866	19.6808	20.0610	20.2495	20.2950	20.2887	20.1756	19.6858	18.9971	18.4282	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3494	18.6411	19.0366	19.5308	19.9110	20.0995	20.1450	20.1387	20.0256	19.5358	18.8471	18.2782	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9787	0.9615	0.9320	0.8615	0.7355	0.5501	0.3844	0.4319	0.6765	0.8895	0.9625	0.9821	(94)
Useful gains	776.2859	893.7000	954.7031	981.1111	887.7987	657.3935	439.1973	459.9608	668.4920	776.8880	758.7211	741.6755	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1763.5799	1724.8853	1573.6898	1334.4559	1030.7075	690.3398	444.9938	469.3125	743.8242	1121.6893	1474.5861	1767.2001	(97)
Space heating kWh	734.5467	558.5565	460.5261	254.4082	106.3241	0.0000	0.0000	0.0000	0.0000	256.5322	515.4228	762.9903	(98a)
Space heating requirement - total per year (kWh/year)												3649.3069	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	734.5467	558.5565	460.5261	254.4082	106.3241	0.0000	0.0000	0.0000	0.0000	256.5322	515.4228	762.9903	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3649.3069	
Space heating per m2											(98c) / (4) =	27.2805	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	734.5467	558.5565	460.5261	254.4082	106.3241	0.0000	0.0000	0.0000	0.0000	256.5322	515.4228	762.9903	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	831.8762	632.5668	521.5471	288.1180	120.4124	0.0000	0.0000	0.0000	0.0000	290.5234	583.7178	864.0887	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0814	88.0551	88.0062	87.9036	87.6979	87.3000	87.3000	87.3000	87.3000	87.9028	88.0399	88.0897	(217)
Fuel for water heating, kWh/month	230.6990	203.3824	215.1969	187.9409	181.4091	162.9741	160.3261	167.6338	170.4392	190.1468	203.4493	228.0391	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.8841	24.7764	22.3084	16.3441	12.6246	10.3144	11.5166	14.9697	19.4442	25.5118	28.8156	31.7425	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.0497	-32.9024	-55.7011	-72.1752	-85.0551	-82.0345	-80.5674	-71.9524	-57.7725	-40.9589	-23.3535	-16.6781	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.6056	-13.9458	-33.9199	-60.7391	-89.1936	-93.1335	-90.6765	-71.1686	-45.1843	-21.6890	-7.8951	-4.2276	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4132.8504	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.6367	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	249.2524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1176.5791	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5896.4945	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4132.8504	0.2100	867.8986	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.6367	0.2100	483.3437	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1351.2423	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	249.2524	0.1443	35.9748	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-639.2006	0.1319	-84.3124	
PV Unit electricity exported	-537.3785	0.1218	-65.4470	
Total			-149.7594	(269)
Total CO2, kg/year			1291.5539	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.6600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4132.8504	1.1300	4670.1209	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.6367	1.1300	2600.8495	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7270.9704	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	249.2524	1.5338	382.3116	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-639.2006	1.4873	-950.7087	
PV Unit electricity exported	-537.3785	0.4468	-240.1251	
Total			-1190.8338	(283)
Total Primary energy kWh/year			7051.7726	(286)
Dwelling Primary energy Rate (DPER)			52.7200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.2900	1.1450	22.0878			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	21.4400	124.5400	0.1800	22.4172			(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping Roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.8901			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	156.5236	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.5600	0.0500	0.5280
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	41.2400	0.0500	2.0620
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.6903	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 72.5804	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	138.3565	138.0090	137.6684	136.0688	135.7695	134.3762	134.3762	134.1182	134.9129	135.7695	136.3749	137.0079	(39)
Average = Sum(39)m / 12 =												136.0673	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0343	1.0317	1.0291	1.0172	1.0149	1.0045	1.0045	1.0026	1.0085	1.0149	1.0195	1.0242	(40)
HLP (average)												1.0172	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	162.4868	179.8962	162.4868	167.9031	162.4868	167.9031	162.4868	162.4868	167.9031	162.4868	167.9031	162.4868	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)

Total internal gains

	656.6747	674.5031	643.9579	621.0807	587.4021	562.5152	539.2545	539.8451	557.5330	580.0888	617.7370	641.8739	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Southwest	2.2400	36.7938	0.6300	0.7000	0.7700	25.1881	(79)
Northwest	7.9300	11.2829	0.6300	0.7000	0.7700	27.3443	(81)

Solar gains	155.0838	273.2478	397.9948	533.5724	634.5551	646.2016	616.2510	538.4312	444.5552	308.5018	187.4087	131.6491	(83)
Total gains	811.7585	947.7509	1041.9527	1154.6531	1221.9572	1208.7168	1155.5054	1078.2763	1002.0882	888.5906	805.1457	773.5231	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.0375	42.1433	42.2476	42.7442	42.8385	43.2826	43.2826	43.3659	43.1105	42.8385	42.6483	42.4512	
alpha	3.8025	3.8096	3.8165	3.8496	3.8559	3.8855	3.8855	3.8911	3.8740	3.8559	3.8432	3.8301	
util living area	0.9878	0.9773	0.9582	0.9072	0.8069	0.6440	0.4925	0.5423	0.7646	0.9305	0.9782	0.9898	(86)
MIT	19.2307	19.4795	19.8283	20.2944	20.6738	20.9036	20.9737	20.9620	20.8055	20.3102	19.6955	19.1937	(87)
Th 2	20.0549	20.0570	20.0591	20.0690	20.0709	20.0796	20.0796	20.0812	20.0762	20.0709	20.0671	20.0632	(88)
util rest of house	0.9852	0.9726	0.9492	0.8867	0.7643	0.5711	0.3974	0.4457	0.7010	0.9109	0.9729	0.9876	(89)
MIT 2	17.9782	18.2951	18.7366	19.3193	19.7646	20.0097	20.0668	20.0613	19.9189	19.3502	18.5790	17.9365	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.2253	18.5288	18.9520	19.5117	19.9439	20.1861	20.2458	20.2390	20.0938	19.5396	18.7992	18.1846	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2253	18.5288	18.9520	19.5117	19.9439	20.1861	20.2458	20.2390	20.0938	19.5396	18.7992	18.1846	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9780	0.9622	0.9355	0.8720	0.7579	0.5801	0.4151	0.4631	0.7023	0.8968	0.9629	0.9813	(94)
Useful gains	793.9190	911.8862	974.7330	1006.8439	926.0642	701.1213	479.6898	499.2989	703.7653	796.8862	775.2637	759.0473	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1926.6512	1880.8937	1714.2460	1443.9169	1119.2762	750.6352	489.9036	514.8765	808.6376	1213.7238	1595.4819	1915.9954	(97)
Space heating kWh	842.7528	651.1730	550.1977	314.6926	143.7497	0.0000	0.0000	0.0000	0.0000	310.1272	590.5571	860.7694	(98a)

Space heating requirement - total per year (kWh/year) 4264.0194

Solar heating kWh

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	842.7528	651.1730	550.1977	314.6926	143.7497	0.0000	0.0000	0.0000	0.0000	310.1272	590.5571	860.7694	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 4264.0194

Space heating per m2 (98c) / (4) = 31.8758 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	842.7528	651.1730	550.1977	314.6926	143.7497	0.0000	0.0000	0.0000	0.0000	310.1272	590.5571	860.7694	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	912.0701	704.7327	595.4520	340.5764	155.5733	0.0000	0.0000	0.0000	0.0000	335.6355	639.1310	931.5686	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)

Efficiency of water heater

											80.3000	(216)
(217)m 86.7533	86.5292	86.1159	85.2489	83.6492	80.3000	80.3000	80.3000	80.3000	85.1918	86.3471	86.8040	(217)

Fuel for water heating, kWh/month

291.8960	258.7099	276.2593	245.9911	243.3565	228.8498	226.3471	235.2227	237.6393	249.2587	260.8091	288.6564	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting 33.7616	27.0848	24.3868	17.8668	13.8009	11.2754	12.5896	16.3645	21.2558	27.8888	31.5003	34.6999	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m -45.3702	-64.5763	-93.6675	-106.2533	-115.2919	-107.7837	-106.3819	-100.0516	-89.0410	-74.2054	-50.0702	-39.1479	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m -23.7838	-50.2420	-100.2773	-151.2461	-200.6459	-201.9191	-199.6160	-168.7712	-123.3327	-72.1450	-31.8434	-18.7976	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	4614.7396	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3042.9959	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	272.4751	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5681.7495	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4614.7396	0.2100	969.0953	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3042.9959	0.2100	639.0291	(264)
Space and water heating			1608.1244	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	272.4751	0.1443	39.3266	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.8410	0.1344	-133.3163	
PV Unit electricity exported	-1342.6201	0.1258	-168.8512	
Total			-302.1675	(269)
Total CO2, kg/year			1357.2128	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4614.7396	1.1300	5214.6557	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3042.9959	1.1300	3438.5853	(278)
Space and water heating			8653.2410	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	272.4751	1.5338	417.9314	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.8410	1.4968	-1484.5461	
PV Unit electricity exported	-1342.6201	0.4616	-619.7904	
Total			-2104.3365	(283)
Total Primary energy kWh/year			7096.9367	(286)
Target Primary Energy Rate (TPER)			53.0500	(287)

Full SAP Calculation Printout

Plot Reference	Plot 54	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	10 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	91 B	**DER**	9.66	**TER**	10.15
Environmental	91 B	**% DER < TER**			4.83
CO_2 Emissions (t/year)	1.11	**DFEE**	33.51	**TFEE**	36.24
Compliance Check	See BREL	**% DFEE < TFEE**			7.54
% DPER < TPER	0.63	**DPER**	52.72	**TPER**	53.05

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		4 * 10 =	40.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		40.0000 / (5) =	0.1161	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.3200	(17)
Infiltration rate			0.2821	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2398	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3058	0.2998	0.2938	0.2638	0.2578	0.2278	0.2278	0.2218	0.2398	0.2578	0.2698	0.2818	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5467	0.5449	0.5432	0.5348	0.5332	0.5260	0.5260	0.5246	0.5288	0.5332	0.5364	0.5397	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			13.4400	1.1450	15.3893			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	21.4400	124.5400	0.2500	31.1350	60.0000	7472.4005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.7316			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)

Internal Floor 2	43.2700	18.0000	778.8600	(32d)
Internal Ceiling 1	47.2300	9.0000	425.0700	(32e)
Internal Ceiling 2	43.2700	9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20938.1606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 156.5236 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.5600	0.0500	0.5280
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	41.2400	0.0130	0.5361
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9675 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 68.6991 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	62.1414	61.9351	61.7329	60.7830	60.6053	59.7780	59.7780	59.6248	60.0966	60.6053	60.9648	61.3407	(38)
Heat transfer coeff	130.8405	130.6342	130.4320	129.4821	129.3044	128.4771	128.4771	128.3239	128.7958	129.3044	129.6639	130.0398	(39)

Average = Sum(39)m / 12 = 129.4813

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9781	0.9766	0.9750	0.9679	0.9666	0.9604	0.9604	0.9593	0.9628	0.9666	0.9693	0.9721	(40)
HLP (average)												0.9679	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)

Energy content (annual) Total = Sum(45)m = 1154.6247
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)

Total per year (kWh/year) = Sum(64)m = 981.4310 (64)
12Total per year (kWh/year) 981 (64)
Electric shower(s)

58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 664.1943 (64a)
Heat gains from water heating, kWh/month

40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.4868	179.8962	162.4868	167.9031	162.4868	167.9031	162.4868	162.4868	167.9031	162.4868	167.9031	162.4868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains	585.1894	604.3763	576.9675	561.6532	532.4235	515.2353	495.1865	493.6357	508.7370	523.0510	553.4805	571.4177	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Southwest	2.2400	36.7938	0.6300	0.7000	0.7700	25.1881	(79)
Northwest	2.0800	11.2829	0.6300	0.7000	0.7700	7.1723	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	155.0838	273.2478	397.9948	533.5724	634.5551	646.2016	616.2510	538.4312	444.5552	308.5018	187.4087	131.6491	(83)
Total gains	740.2733	877.6241	974.9623	1095.2256	1166.9787	1161.4370	1111.4375	1032.0670	953.2922	831.5528	740.8892	703.0668	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.4522	44.5225	44.5915	44.9186	44.9803	45.2700	45.2700	45.3240	45.1580	44.9803	44.8556	44.7260	
alpha	3.9635	3.9682	3.9728	3.9946	3.9987	4.0180	4.0180	4.0216	4.0105	3.9987	3.9904	3.9817	
util living area	0.9909	0.9816	0.9638	0.9135	0.8118	0.6453	0.4915	0.5444	0.7714	0.9386	0.9828	0.9925	(86)
MIT	19.2719	19.5210	19.8662	20.3240	20.6952	20.9129	20.9773	20.9660	20.8167	20.3261	19.7181	19.2270	(87)
Th 2	20.1016	20.1029	20.1042	20.1101	20.1112	20.1164	20.1164	20.1174	20.1144	20.1112	20.1090	20.1066	(88)
util rest of house	0.9890	0.9778	0.9560	0.8945	0.7708	0.5745	0.3999	0.4508	0.7101	0.9211	0.9786	0.9910	(89)
MIT 2	18.5118	18.7595	19.1005	19.5468	19.8866	20.0669	20.1077	20.1033	19.9976	19.5573	18.9613	18.4708	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6618	18.9098	19.2516	19.7001	20.0462	20.2338	20.2793	20.2735	20.1592	19.7089	19.1106	18.6200	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6618	18.9098	19.2516	19.7001	20.0462	20.2338	20.2793	20.2735	20.1592	19.7089	19.1106	18.6200	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9711	0.9467	0.8841	0.7675	0.5845	0.4173	0.4681	0.7135	0.9114	0.9723	0.9873	(94)
Useful gains	728.9824	852.2398	922.9761	968.3234	895.6728	678.8273	463.8271	483.0600	680.2081	757.8537	720.3455	694.1582	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1879.1008	1830.1556	1663.2124	1398.4246	1079.1953	723.8098	472.7016	497.0638	780.4029	1177.8260	1557.3376	1875.1751	(97)
Space heating kWh	855.6880	657.1594	550.7358	309.6729	136.5408	0.0000	0.0000	0.0000	0.0000	312.4594	602.6344	878.6766	(98a)
Space heating requirement - total per year (kWh/year)												4303.5673	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	855.6880	657.1594	550.7358	309.6729	136.5408	0.0000	0.0000	0.0000	0.0000	312.4594	602.6344	878.6766	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4303.5673	
Space heating per m2											(98c) / (4) =	32.1714	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1207.6847	950.7305	975.2616	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8238	0.8880	0.8572	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	994.8548	844.2512	835.9734	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1281.6241	1226.5616	1137.1142	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	206.4739	284.4389	224.0488	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	51.6185	71.1097	56.0122	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												178.7404	(107)
Energy for space heating												32.1714	(99)
Energy for space cooling												1.3362	(108)
Total												33.5076	(109)
Fabric Energy Efficiency (DFEE)												33.5	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.2900	1.1450	22.0878			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	21.4400	124.5400	0.1800	22.4172			(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping Roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.8901			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 156.5236 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.5600	0.0500	0.5280
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	41.2400	0.0500	2.0620
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.6903 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 72.5804 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	138.3565	138.0090	137.6684	136.0688	135.7695	134.3762	134.3762	134.1182	134.9129	135.7695	136.3749	137.0079	(39)

Average = Sum(39)m / 12 = 136.0673

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0343	1.0317	1.0291	1.0172	1.0149	1.0045	1.0045	1.0026	1.0085	1.0149	1.0195	1.0242	(40)
HLP (average)												1.0172	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)

Energy content (annual) Total = Sum(45)m = 1154.6247

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060 (64)
										Total per year (kWh/year) = Sum(64)m =		981.4310 (64)

12Total per year (kWh/year) 981 (64)

Electric shower(s)

	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910 (64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	664.1943 (64a)

Heat gains from water heating, kWh/month

	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	162.4868	179.8962	162.4868	167.9031	162.4868	167.9031	162.4868	162.4868	167.9031	162.4868	167.9031	162.4868	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)

Total internal gains

	585.1894	604.3763	576.9675	561.6532	532.4235	515.2353	495.1865	493.6357	508.7370	523.0510	553.4805	571.4177	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Southwest	2.2400	36.7938	0.6300	0.7000	0.7700	25.1881	(79)
Northwest	7.9300	11.2829	0.6300	0.7000	0.7700	27.3443	(81)

Solar gains	155.0838	273.2478	397.9948	533.5724	634.5551	646.2016	616.2510	538.4312	444.5552	308.5018	187.4087	131.6491	(83)
Total gains	740.2733	877.6241	974.9623	1095.2256	1166.9787	1161.4370	1111.4375	1032.0670	953.2922	831.5528	740.8892	703.0668	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.0375	42.1433	42.2476	42.7442	42.8385	43.2826	43.2826	43.3659	43.1105	42.8385	42.6483	42.4512	
alpha	3.8025	3.8096	3.8165	3.8496	3.8559	3.8855	3.8855	3.8911	3.8740	3.8559	3.8432	3.8301	
util living area													
	0.9910	0.9822	0.9657	0.9191	0.8241	0.6628	0.5095	0.5625	0.7853	0.9422	0.9834	0.9926	(86)
MIT	19.1507	19.4041	19.7615	20.2462	20.6453	20.8933	20.9705	20.9569	20.7847	20.2591	19.6260	19.1140	(87)
Th 2	20.0549	20.0570	20.0591	20.0690	20.0709	20.0796	20.0796	20.0812	20.0762	20.0709	20.0671	20.0632	(88)
util rest of house													
	0.9891	0.9784	0.9581	0.9005	0.7834	0.5897	0.4121	0.4638	0.7236	0.9252	0.9792	0.9910	(89)
MIT 2	18.3572	18.6100	18.9640	19.4406	19.8089	20.0188	20.0683	20.0634	19.9387	19.4620	18.8392	18.3269	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.5138	18.7666	19.1214	19.5995	19.9739	20.1913	20.2463	20.2397	20.1056	19.6193	18.9944	18.4822	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5138	18.7666	19.1214	19.5995	19.9739	20.1913	20.2463	20.2397	20.1056	19.6193	18.9944	18.4822	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9716	0.9484	0.8894	0.7787	0.5992	0.4304	0.4817	0.7258	0.9148	0.9727	0.9872	(94)
Useful gains	728.9280	852.6568	924.6925	974.0632	908.6877	695.9003	478.3987	497.1218	691.8993	760.7359	720.6271	694.0693	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1966.5675	1913.7185	1737.5615	1455.8706	1123.3424	751.3390	489.9760	514.9689	810.2333	1224.5441	1622.1034	1956.7687	(97)
Space heating kWh													
	920.8038	713.0335	604.7745	346.9013	159.7031	0.0000	0.0000	0.0000	0.0000	345.0733	649.0629	939.4483	(98a)
Space heating requirement - total per year (kWh/year)												4678.8007	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	920.8038	713.0335	604.7745	346.9013	159.7031	0.0000	0.0000	0.0000	0.0000	345.0733	649.0629	939.4483	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4678.8007	
Space heating per m2											(98c) / (4) =	34.9765	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1263.1365	994.3840	1019.2984	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8011	0.8694	0.8366	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1011.8358	864.5071	852.7539	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1281.6241	1226.5616	1137.1142	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	194.2476	269.3685	211.5640	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	48.5619	67.3421	52.8910	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												168.7950	(107)
Energy for space heating												34.9765	(99)
Energy for space cooling												1.2618	(108)
Total												36.2383	(109)
Fabric Energy Efficiency (TFEE)												36.2	(109)

Full SAP Calculation Printout

Plot Reference	Plot 54	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	10 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	91 B	**DER**	9.66	**TER**	10.15
Environmental	91 B	**% DER < TER**			4.83
CO_2 Emissions (t/year)	1.11	**DFEE**	33.51	**TFEE**	36.24
Compliance Check	See BREL	**% DFEE < TFEE**			7.54
% DPER < TPER	0.63	**DPER**	52.72	**TPER**	53.05

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.3200 (17)
Infiltration rate			0.1660 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1411 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1799	0.1764	0.1728	0.1552	0.1517	0.1340	0.1340	0.1305	0.1411	0.1517	0.1587	0.1658	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			13.4400	1.1450	15.3893			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	21.4400	124.5400	0.2500	31.1350	60.0000	7472.4005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.7316			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20938.1606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 156.5236 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.5600	0.0500	0.5280
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	41.2400	0.0130	0.5361
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9675 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 68.6991 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	(39)
Average = Sum(39)m / 12 =												125.5274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	(40)
HLP (average)												0.9384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
12Total per year (kWh/year)												2020	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.4868	179.8962	162.4868	167.9031	162.4868	167.9031	162.4868	162.4868	167.9031	162.4868	167.9031	162.4868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	638.1284	656.1893	626.3173	605.2168	572.5498	548.7434	526.2863	526.4311	543.5652	564.9129	600.8722	623.5809	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Southwest	2.2400	36.7938	0.6300	0.7000	0.7700	25.1881	(79)
Northwest	2.0800	11.2829	0.6300	0.7000	0.7700	7.1723	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	155.0838	273.2478	397.9948	533.5724	634.5551	646.2016	616.2510	538.4312	444.5552	308.5018	187.4087	131.6491	(83)
Total gains	793.2123	929.4371	1024.3121	1138.7893	1207.1050	1194.9451	1142.5372	1064.8623	988.1204	873.4147	788.2809	755.2301	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	
alpha	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	
util living area	0.9882	0.9770	0.9560	0.8998	0.7898	0.6222	0.4703	0.5210	0.7473	0.9265	0.9783	0.9903	(86)
MIT	19.4205	19.6606	19.9880	20.4052	20.7425	20.9280	20.9820	20.9727	20.8463	20.4028	19.8283	19.3621	(87)
Th 2	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	(88)
util rest of house	0.9858	0.9724	0.9469	0.8789	0.7476	0.5531	0.3834	0.4315	0.6852	0.9067	0.9732	0.9883	(89)
MIT 2	18.2730	18.5774	18.9897	19.5028	19.8935	20.0828	20.1262	20.1206	20.0108	19.5096	18.7929	18.1987	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.4994	18.7911	19.1866	19.6808	20.0610	20.2495	20.2950	20.2887	20.1756	19.6858	18.9971	18.4282	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3494	18.6411	19.0366	19.5308	19.9110	20.0995	20.1450	20.1387	20.0256	19.5358	18.8471	18.2782	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9787	0.9615	0.9320	0.8615	0.7355	0.5501	0.3844	0.4319	0.6765	0.8895	0.9625	0.9821	(94)
Useful gains	776.2859	893.7000	954.7031	981.1111	887.7987	657.3935	439.1973	459.9608	668.4920	776.8880	758.7211	741.6755	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1763.5799	1724.8853	1573.6898	1334.4559	1030.7075	690.3398	444.9938	469.3125	743.8242	1121.6893	1474.5861	1767.2001	(97)
Space heating kWh	734.5467	558.5565	460.5261	254.4082	106.3241	0.0000	0.0000	0.0000	0.0000	256.5322	515.4228	762.9903	(98a)
Space heating requirement - total per year (kWh/year)												3649.3069	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	734.5467	558.5565	460.5261	254.4082	106.3241	0.0000	0.0000	0.0000	0.0000	256.5322	515.4228	762.9903	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3649.3069	
Space heating per m2											(98c) / (4) =	27.2805	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	734.5467	558.5565	460.5261	254.4082	106.3241	0.0000	0.0000	0.0000	0.0000	256.5322	515.4228	762.9903	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	831.8762	632.5668	521.5471	288.1180	120.4124	0.0000	0.0000	0.0000	0.0000	290.5234	583.7178	864.0887	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0814	88.0551	88.0062	87.9036	87.6979	87.3000	87.3000	87.3000	87.3000	87.9028	88.0399	88.0897	(217)
Fuel for water heating, kWh/month	230.6990	203.3824	215.1969	187.9409	181.4091	162.9741	160.3261	167.6338	170.4392	190.1468	203.4493	228.0391	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.8841	24.7764	22.3084	16.3441	12.6246	10.3144	11.5166	14.9697	19.4442	25.5118	28.8156	31.7425	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.0497	-32.9024	-55.7011	-72.1752	-85.0551	-82.0345	-80.5674	-71.9524	-57.7725	-40.9589	-23.3535	-16.6781	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.6056	-13.9458	-33.9199	-60.7391	-89.1936	-93.1335	-90.6765	-71.1686	-45.1843	-21.6890	-7.8951	-4.2276	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4132.8504	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.6367	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	249.2524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1176.5791	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5896.4945	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4132.8504	0.2100	867.8986	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.6367	0.2100	483.3437	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1351.2423	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	249.2524	0.1443	35.9748	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-639.2006	0.1319	-84.3124	
PV Unit electricity exported	-537.3785	0.1218	-65.4470	
Total			-149.7594	(269)
Total CO2, kg/year			1291.5539	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.6600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4132.8504	1.1300	4670.1209	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.6367	1.1300	2600.8495	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7270.9704	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	249.2524	1.5338	382.3116	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-639.2006	1.4873	-950.7087	
PV Unit electricity exported	-537.3785	0.4468	-240.1251	
Total			-1190.8338	(283)
Total Primary energy kWh/year			7051.7726	(286)
Dwelling Primary energy Rate (DPER)			52.7200	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			19.2900	1.1450	22.0878			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	21.4400	124.5400	0.1800	22.4172			(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping Roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.8901			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	156.5236	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.5600	0.0500	0.5280
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	41.2400	0.0500	2.0620
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.6903	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 72.5804	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	138.3565	138.0090	137.6684	136.0688	135.7695	134.3762	134.3762	134.1182	134.9129	135.7695	136.3749	137.0079	(39)
Average = Sum(39)m / 12 =												136.0673	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0343	1.0317	1.0291	1.0172	1.0149	1.0045	1.0045	1.0026	1.0085	1.0149	1.0195	1.0242	(40)
HLP (average)												1.0172	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	162.4868	179.8962	162.4868	167.9031	162.4868	167.9031	162.4868	162.4868	167.9031	162.4868	167.9031	162.4868	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)

Total internal gains

	656.6747	674.5031	643.9579	621.0807	587.4021	562.5152	539.2545	539.8451	557.5330	580.0888	617.7370	641.8739	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Southwest	2.2400	36.7938	0.6300	0.7000	0.7700	25.1881	(79)
Northwest	7.9300	11.2829	0.6300	0.7000	0.7700	27.3443	(81)

Solar gains	155.0838	273.2478	397.9948	533.5724	634.5551	646.2016	616.2510	538.4312	444.5552	308.5018	187.4087	131.6491	(83)
Total gains	811.7585	947.7509	1041.9527	1154.6531	1221.9572	1208.7168	1155.5054	1078.2763	1002.0882	888.5906	805.1457	773.5231	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.0375	42.1433	42.2476	42.7442	42.8385	43.2826	43.2826	43.3659	43.1105	42.8385	42.6483	42.4512	
alpha	3.8025	3.8096	3.8165	3.8496	3.8559	3.8855	3.8855	3.8911	3.8740	3.8559	3.8432	3.8301	
util living area	0.9878	0.9773	0.9582	0.9072	0.8069	0.6440	0.4925	0.5423	0.7646	0.9305	0.9782	0.9898	(86)
MIT	19.2307	19.4795	19.8283	20.2944	20.6738	20.9036	20.9737	20.9620	20.8055	20.3102	19.6955	19.1937	(87)
Th 2	20.0549	20.0570	20.0591	20.0690	20.0709	20.0796	20.0796	20.0812	20.0762	20.0709	20.0671	20.0632	(88)
util rest of house	0.9852	0.9726	0.9492	0.8867	0.7643	0.5711	0.3974	0.4457	0.7010	0.9109	0.9729	0.9876	(89)
MIT 2	17.9782	18.2951	18.7366	19.3193	19.7646	20.0097	20.0668	20.0613	19.9189	19.3502	18.5790	17.9365	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.2253	18.5288	18.9520	19.5117	19.9439	20.1861	20.2458	20.2390	20.0938	19.5396	18.7992	18.1846	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2253	18.5288	18.9520	19.5117	19.9439	20.1861	20.2458	20.2390	20.0938	19.5396	18.7992	18.1846	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9780	0.9622	0.9355	0.8720	0.7579	0.5801	0.4151	0.4631	0.7023	0.8968	0.9629	0.9813	(94)
Useful gains	793.9190	911.8862	974.7330	1006.8439	926.0642	701.1213	479.6898	499.2989	703.7653	796.8862	775.2637	759.0473	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1926.6512	1880.8937	1714.2460	1443.9169	1119.2762	750.6352	489.9036	514.8765	808.6376	1213.7238	1595.4819	1915.9954	(97)
Space heating kWh	842.7528	651.1730	550.1977	314.6926	143.7497	0.0000	0.0000	0.0000	0.0000	310.1272	590.5571	860.7694	(98a)

Space heating requirement - total per year (kWh/year) 4264.0194

Solar heating kWh

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

	842.7528	651.1730	550.1977	314.6926	143.7497	0.0000	0.0000	0.0000	0.0000	310.1272	590.5571	860.7694	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 4264.0194

Space heating per m2 (98c) / (4) = 31.8758 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	842.7528	651.1730	550.1977	314.6926	143.7497	0.0000	0.0000	0.0000	0.0000	310.1272	590.5571	860.7694	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	912.0701	704.7327	595.4520	340.5764	155.5733	0.0000	0.0000	0.0000	0.0000	335.6355	639.1310	931.5686	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)

Efficiency of water heater

											80.3000	(216)
(217)m 86.7533	86.5292	86.1159	85.2489	83.6492	80.3000	80.3000	80.3000	80.3000	85.1918	86.3471	86.8040	(217)

Fuel for water heating, kWh/month

291.8960	258.7099	276.2593	245.9911	243.3565	228.8498	226.3471	235.2227	237.6393	249.2587	260.8091	288.6564	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting 33.7616	27.0848	24.3868	17.8668	13.8009	11.2754	12.5896	16.3645	21.2558	27.8888	31.5003	34.6999	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m -45.3702	-64.5763	-93.6675	-106.2533	-115.2919	-107.7837	-106.3819	-100.0516	-89.0410	-74.2054	-50.0702	-39.1479	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m -23.7838	-50.2420	-100.2773	-151.2461	-200.6459	-201.9191	-199.6160	-168.7712	-123.3327	-72.1450	-31.8434	-18.7976	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	4614.7396	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3042.9959	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	272.4751	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5681.7495	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4614.7396	0.2100	969.0953	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3042.9959	0.2100	639.0291	(264)
Space and water heating			1608.1244	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	272.4751	0.1443	39.3266	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.8410	0.1344	-133.3163	
PV Unit electricity exported	-1342.6201	0.1258	-168.8512	
Total			-302.1675	(269)
Total CO2, kg/year			1357.2128	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4614.7396	1.1300	5214.6557	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3042.9959	1.1300	3438.5853	(278)
Space and water heating			8653.2410	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	272.4751	1.5338	417.9314	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.8410	1.4968	-1484.5461	
PV Unit electricity exported	-1342.6201	0.4616	-619.7904	
Total			-2104.3365	(283)
Total Primary energy kWh/year			7096.9367	(286)
Target Primary Energy Rate (TPER)			53.0500	(287)

Full SAP Calculation Printout

Plot Reference	Plot 54	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 SD
Plot Address	10 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	91 B	**DER**	9.66	**TER**	10.15
Environmental	91 B	**% DER < TER**			4.83
CO_2 Emissions (t/year)	1.11	**DFEE**	33.51	**TFEE**	36.24
Compliance Check	See BREL	**% DFEE < TFEE**			7.54
% DPER < TPER	0.63	**DPER**	52.72	**TPER**	53.05

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3200	(17)
Infiltration rate		0.1660	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1411	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1799	0.1764	0.1728	0.1552	0.1517	0.1340	0.1340	0.1305	0.1411	0.1517	0.1587	0.1658	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			13.4400	1.1450	15.3893			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	21.4400	124.5400	0.2500	31.1350	60.0000	7472.4005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.7316			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20938.1606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 156.5236 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.5600	0.0500	0.5280
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	41.2400	0.0130	0.5361
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9675 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 68.6991 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	(39)
Average = Sum(39)m / 12 =												125.5274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	(40)
HLP (average)												0.9384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2843	31.3392	25.4867	19.2951	14.4233	12.1768	13.1574	17.1025	22.9550	29.1466	34.0184	36.2649	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	706.6249	704.8760	682.6686	641.6739	599.0914	557.7914	535.1635	537.7088	559.1714	600.4133	646.2880	686.4904	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Southwest	2.2400	36.7938	0.6300	0.7000	0.7700	25.1881	(79)
Northwest	2.0800	11.2829	0.6300	0.7000	0.7700	7.1723	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	155.0838	273.2478	397.9948	533.5724	634.5551	646.2016	616.2510	538.4312	444.5552	308.5018	187.4087	131.6491	(83)
Total gains	861.7088	978.1238	1080.6634	1175.2464	1233.6466	1203.9930	1151.4144	1076.1400	1003.7266	908.9151	833.6968	818.1396	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	
alpha	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	
util living area	0.9843	0.9728	0.9482	0.8913	0.7807	0.6186	0.4670	0.5162	0.7403	0.9179	0.9739	0.9872	(86)
MIT	19.4979	19.7129	20.0426	20.4326	20.7542	20.9295	20.9824	20.9736	20.8518	20.4329	19.8773	19.4340	(87)
Th 2	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	(88)
util rest of house	0.9812	0.9674	0.9378	0.8692	0.7378	0.5496	0.3805	0.4273	0.6778	0.8964	0.9678	0.9846	(89)
MIT 2	18.3710	18.6430	19.0569	19.5346	19.9055	20.0840	20.1264	20.1211	20.0157	19.5448	18.8542	18.2899	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.5933	18.8541	19.2513	19.7118	20.0729	20.2508	20.2953	20.2893	20.1807	19.7200	19.0560	18.5156	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4433	18.7041	19.1013	19.5618	19.9229	20.1008	20.1453	20.1393	20.0307	19.5700	18.9060	18.3656	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9725	0.9556	0.9221	0.8520	0.7262	0.5467	0.3816	0.4278	0.6694	0.8790	0.9560	0.9770	(94)
Useful gains	838.0313	934.6490	996.4481	1001.2516	895.8613	658.2723	439.3851	460.3552	671.9414	798.9411	797.0301	799.3026	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1775.3778	1732.7893	1581.8123	1338.3447	1032.2024	690.4971	445.0289	469.3853	744.4594	1125.9844	1481.9822	1778.1762	(97)
Space heating kWh	697.3858	536.3503	435.5110	242.7070	101.4378	0.0000	0.0000	0.0000	0.0000	243.3202	493.1655	728.2820	(98a)
Space heating requirement - total per year (kWh/year)												3478.1595	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	697.3858	536.3503	435.5110	242.7070	101.4378	0.0000	0.0000	0.0000	0.0000	243.3202	493.1655	728.2820	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3478.1595	
Space heating per m2											(98c) / (4) =	26.0010	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	697.3858	536.3503	435.5110	242.7070	101.4378	0.0000	0.0000	0.0000	0.0000	243.3202	493.1655	728.2820	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	789.7914	607.4182	493.2174	274.8664	114.8786	0.0000	0.0000	0.0000	0.0000	275.5608	558.5113	824.7814	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0724	88.0475	87.9945	87.8922	87.6866	87.3000	87.3000	87.3000	87.3000	87.8900	88.0313	88.0819	(217)
Fuel for water heating, kWh/month	230.7226	203.3999	215.2256	187.9651	181.4323	162.9741	160.3261	167.6338	170.4392	190.1744	203.4691	228.0594	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.8841	24.7764	22.3084	16.3441	12.6246	10.3144	11.5166	14.9697	19.4442	25.5118	28.8156	31.7425	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.0497	-32.9024	-55.7011	-72.1752	-85.0551	-82.0345	-80.5674	-71.9524	-57.7725	-40.9589	-23.3535	-16.6781	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.6056	-13.9458	-33.9199	-60.7391	-89.1936	-93.1335	-90.6765	-71.1686	-45.1843	-21.6890	-7.8951	-4.2276	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	3939.0255	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.8215	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	249.2524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1176.5791	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5702.8544	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3939.0255	3.6400	143.3805	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.8215	3.6400	83.7863	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	249.2524	16.4900	41.1017	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-639.2006	16.4900	-105.4042	
PV Unit electricity exported	-537.3785	5.5900	-30.0395	
Total			-135.4436	(252)
Total energy cost			289.0261	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5820	(257)
SAP value		90.5653	
SAP rating (Section 12)		91	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3939.0255	0.2100	827.1954	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.8215	0.2100	483.3825	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1310.5779	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	249.2524	0.1443	35.9748	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-639.2006	0.1319	-84.3124	
PV Unit electricity exported	-537.3785	0.1218	-65.4470	
Total			-149.7594	(269)
Total CO2, kg/year			1250.8895	(272)
CO2 emissions per m2			9.3500	(273)
EI value			90.6238	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3200	(17)
Infiltration rate		0.1660	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1411	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1517	0.1446	0.1446	0.1340	0.1376	0.1199	0.1199	0.1164	0.1199	0.1340	0.1305	0.1411	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			13.4400	1.1450	15.3893			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	21.4400	124.5400	0.2500	31.1350	60.0000	7472.4005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.7316			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20938.1606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		156.5236 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.5600	0.0500	0.5280
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	41.2400	0.0130	0.5361
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.9675 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	68.6991 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	(39)
Average = Sum(39)m / 12 =												125.5274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	(40)
HLP (average)												0.9384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2843	31.3392	25.4867	19.2951	14.4233	12.1768	13.1574	17.1025	22.9550	29.1466	34.0184	36.2649	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	706.6249	704.8760	682.6686	641.6739	599.0914	557.7914	535.1635	537.7088	559.1714	600.4133	646.2880	686.4904	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Southwest	2.2400	43.0593	0.6300	0.7000	0.7700	29.4772	(79)
Northwest	2.0800	13.7804	0.6300	0.7000	0.7700	8.7599	(81)
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)

Solar gains	182.8886	282.1680	409.9509	561.5458	653.4839	705.0185	665.2930	594.0652	489.3724	342.4487	217.8242	156.0883	(83)
Total gains	889.5136	987.0440	1092.6194	1203.2198	1252.5753	1262.8099	1200.4565	1131.7740	1048.5439	942.8620	864.1123	842.5787	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	
alpha	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	
util living area	0.9793	0.9669	0.9353	0.8576	0.7122	0.4995	0.3421	0.3727	0.6541	0.8851	0.9636	0.9828	(86)
MIT	19.6464	19.8372	20.1753	20.5650	20.8499	20.9735	20.9958	20.9940	20.9189	20.5692	20.0382	19.5946	(87)
Th 2	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	(88)
util rest of house	0.9751	0.9602	0.9220	0.8289	0.6586	0.4230	0.2539	0.2800	0.5794	0.8552	0.9549	0.9792	(89)
MIT 2	18.5599	18.8004	19.2220	19.6912	20.0064	20.1195	20.1337	20.1330	20.0777	19.7063	19.0568	18.4946	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.7742	19.0050	19.4100	19.8636	20.1728	20.2880	20.3038	20.3029	20.2437	19.8765	19.2504	18.7116	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6242	18.8550	19.2600	19.7136	20.0228	20.1380	20.1538	20.1529	20.0937	19.7265	19.1004	18.5616	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9648	0.9471	0.9053	0.8128	0.6511	0.4232	0.2558	0.2820	0.5755	0.8382	0.9410	0.9700	(94)
Useful gains	858.2136	934.8188	989.1220	978.0159	815.4978	534.4579	307.1336	319.1345	603.4856	790.3398	813.1013	817.2991	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1697.6593	1651.3074	1488.7610	1231.8701	894.1053	544.5341	308.0139	320.4564	639.3975	1032.6525	1393.4104	1689.7972	(97)
Space heating kWh	624.5476	481.4803	371.7314	182.7750	58.4839	0.0000	0.0000	0.0000	0.0000	180.2807	417.8226	649.1386	(98a)
Space heating requirement - total per year (kWh/year)												2966.2602	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

624.5476	481.4803	371.7314	182.7750	58.4839	0.0000	0.0000	0.0000	0.0000	180.2807	417.8226	649.1386	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2966.2602

Space heating per m2 (98c) / (4) = 22.1743 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 88.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	624.5476	481.4803	371.7314	182.7750	58.4839	0.0000	0.0000	0.0000	0.0000	180.2807	417.8226	649.1386	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	707.3019	545.2778	420.9869	206.9932	66.2332	0.0000	0.0000	0.0000	0.0000	204.1684	473.1853	735.1513	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0524	88.0266	87.9599	87.8224	87.5666	87.3000	87.3000	87.3000	87.3000	87.8161	87.9975	88.0616	(217)
Fuel for water heating, kWh/month													
	230.7749	203.4482	215.3102	188.1146	181.6811	162.9741	160.3261	167.6338	170.4392	190.3346	203.5472	228.1119	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.8841	24.7764	22.3084	16.3441	12.6246	10.3144	11.5166	14.9697	19.4442	25.5118	28.8156	31.7425	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.8541	-34.7097	-58.1255	-75.6236	-87.1938	-86.8324	-84.8252	-77.3007	-62.7694	-45.5067	-27.3095	-19.9833	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.4912	-15.3098	-36.7094	-66.6984	-94.0631	-105.6546	-101.6017	-82.8339	-53.2284	-26.2562	-10.3057	-5.7010	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 3359.2981 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 87.3000

Water heating fuel used 2302.6959 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)

mechanical ventilation fans (SFP = 0.1950) 81.9360 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 167.9360 (231)

Electricity for lighting (calculated in Appendix L) 249.2524 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -1289.8871 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (235)

Appendix Q - special features

Energy saved or generated -0.0000 (236)

Energy used 0.0000 (237)

Total delivered energy for all uses 5010.6933 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3359.2981	7.3200	245.9006	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.6959	7.3200	168.5573	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	249.2524	27.6700	68.9681	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-684.0338	27.6700	-189.2721	
PV Unit electricity exported	-605.8534	5.8100	-35.2001	
Total			-224.4722	(252)
Total energy cost			474.6826	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy	Emission factor	Emissions

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	3359.2981	0.2100	705.4526	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.6959	0.2100	483.5661	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1189.0187	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	249.2524	0.1443	35.9748	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-684.0338	0.1321	-90.3797	
PV Unit electricity exported	-605.8534	0.1217	-73.7338	
Total			-164.1135	(269)
Total CO2, kg/year			1114.9762	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3359.2981	1.1300	3796.0068	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.6959	1.1300	2602.0463	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6398.0532	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	249.2524	1.5338	382.3116	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-684.0338	1.4882	-1017.9600	
PV Unit electricity exported	-605.8534	0.4465	-270.4859	
Total			-1288.4459	(283)
Total Primary energy kWh/year			6081.2432	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 91
Current environmental impact rating: B 91

N Solar water heating	SAP increase too small
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.4	-£ 34	-146 kg (13.1%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 91
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£177	£177	£0
Mains gas	£522	£522	£0
Space heating	£400	£400	£0
Water heating	£230	£230	£0
Lighting	£69	£69	£0
Generated (PV)	-£224	-£224	£0
Total cost of fuels	£475	£475	£0
Total cost of uses	£475	£475	£0
Delivered energy	37 kWh/m²	37 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	45 kWh/m²	45 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)

Second floor	43.2700 (1d) x	2.6700 (2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3200	(17)
Infiltration rate		0.1660	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1411	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1799	0.1764	0.1728	0.1552	0.1517	0.1340	0.1340	0.1305	0.1411	0.1517	0.1587	0.1658	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			13.4400	1.1450	15.3893			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	21.4400	124.5400	0.2500	31.1350	60.0000	7472.4005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.7316			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20938.1606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		156.5236 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.5600	0.0500	0.5280
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	41.2400	0.0130	0.5361
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.9675 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	68.6991 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	(39)
Average = Sum(39)m / 12 =												125.5274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	(40)
HLP (average)												0.9384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9041	(42)
Hot water usage for mixer showers													
	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths													
	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses													
	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)
Average daily hot water use (litres/day)												114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month													
	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
Heat gains from water heating, kWh/month													
	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	35.2843	31.3392	25.4867	19.2951	14.4233	12.1768	13.1574	17.1025	22.9550	29.1466	34.0184	36.2649	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains													
	706.6249	704.8760	682.6686	641.6739	599.0914	557.7914	535.1635	537.7088	559.1714	600.4133	646.2880	686.4904	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Southwest	2.2400	36.7938	0.6300	0.7000	0.7700	25.1881	(79)
Northwest	2.0800	11.2829	0.6300	0.7000	0.7700	7.1723	(81)
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)

Solar gains	155.0838	273.2478	397.9948	533.5724	634.5551	646.2016	616.2510	538.4312	444.5552	308.5018	187.4087	131.6491	(83)
Total gains	861.7088	978.1238	1080.6634	1175.2464	1233.6466	1203.9930	1151.4144	1076.1400	1003.7266	908.9151	833.6968	818.1396	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	
alpha	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	
util living area													
	0.9843	0.9728	0.9482	0.8913	0.7807	0.6186	0.4670	0.5162	0.7403	0.9179	0.9739	0.9872	(86)
MIT	19.4979	19.7129	20.0426	20.4326	20.7542	20.9295	20.9824	20.9736	20.8518	20.4329	19.8773	19.4340	(87)
Th 2	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	(88)
util rest of house													
	0.9812	0.9674	0.9378	0.8692	0.7378	0.5496	0.3805	0.4273	0.6778	0.8964	0.9678	0.9846	(89)
MIT 2	18.3710	18.6430	19.0569	19.5346	19.9055	20.0840	20.1264	20.1211	20.0157	19.5448	18.8542	18.2899	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.5933	18.8541	19.2513	19.7118	20.0729	20.2508	20.2953	20.2893	20.1807	19.7200	19.0560	18.5156	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4433	18.7041	19.1013	19.5618	19.9229	20.1008	20.1453	20.1393	20.0307	19.5700	18.9060	18.3656	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9725	0.9556	0.9221	0.8520	0.7262	0.5467	0.3816	0.4278	0.6694	0.8790	0.9560	0.9770	(94)
Useful gains	838.0313	934.6490	996.4481	1001.2516	895.8613	658.2723	439.3851	460.3552	671.9414	798.9411	797.0301	799.3026	(95)

Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1775.3778	1732.7893	1581.8123	1338.3447	1032.2024	690.4971	445.0289	469.3853	744.4594	1125.9844	1481.9822	1778.1762	(97)
Space heating kWh	697.3858	536.3503	435.5110	242.7070	101.4378	0.0000	0.0000	0.0000	0.0000	243.3202	493.1655	728.2820	(98a)
Space heating requirement - total per year (kWh/year)												3478.1595	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	697.3858	536.3503	435.5110	242.7070	101.4378	0.0000	0.0000	0.0000	0.0000	243.3202	493.1655	728.2820	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3478.1595	
Space heating per m2											(98c) / (4) =	26.0010	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												88.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	697.3858	536.3503	435.5110	242.7070	101.4378	0.0000	0.0000	0.0000	0.0000	243.3202	493.1655	728.2820	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	789.7914	607.4182	493.2174	274.8664	114.8786	0.0000	0.0000	0.0000	0.0000	275.5608	558.5113	824.7814	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0724	88.0475	87.9945	87.8922	87.6866	87.3000	87.3000	87.3000	87.3000	87.8900	88.0313	88.0819	(217)
Fuel for water heating, kWh/month	230.7226	203.3999	215.2256	187.9651	181.4323	162.9741	160.3261	167.6338	170.4392	190.1744	203.4691	228.0594	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.8841	24.7764	22.3084	16.3441	12.6246	10.3144	11.5166	14.9697	19.4442	25.5118	28.8156	31.7425	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.0497	-32.9024	-55.7011	-72.1752	-85.0551	-82.0345	-80.5674	-71.9524	-57.7725	-40.9589	-23.3535	-16.6781	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.6056	-13.9458	-33.9199	-60.7391	-89.1936	-93.1335	-90.6765	-71.1686	-45.1843	-21.6890	-7.8951	-4.2276	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3939.0255	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2301.8215	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)													
mechanical ventilation fans (SFP = 0.1950)												81.9360	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												167.9360	(231)
Electricity for lighting (calculated in Appendix L)												249.2524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1176.5791	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												5702.8544	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3939.0255	3.6400	143.3805	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.8215	3.6400	83.7863	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	249.2524	16.4900	41.1017	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-639.2006	16.4900	-105.4042	
PV Unit electricity exported	-537.3785	5.5900	-30.0395	
Total			-135.4436	(252)
Total energy cost			289.0261	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5820 (257)
SAP value		90.5653
SAP rating (Section 12)		91 (258)
SAP band		B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3939.0255	0.2100	827.1954	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.8215	0.2100	483.3825	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1310.5779	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	249.2524	0.1443	35.9748	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-639.2006	0.1319	-84.3124	
PV Unit electricity exported	-537.3785	0.1218	-65.4470	
Total			-149.7594	(269)
Total CO2, kg/year			1250.8895	(272)
CO2 emissions per m2			9.3500	(273)
EI value			90.6238	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.3200	(17)
Infiltration rate		0.1660	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1411	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1517	0.1446	0.1446	0.1340	0.1376	0.1199	0.1199	0.1164	0.1199	0.1340	0.1305	0.1411	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							

Front Door			2.1500	1.2000	2.5800			(26)
Window-SF			13.4400	1.1450	15.3893			(27)
Window GF-FF			5.8500	1.1450	6.6985			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	21.4400	124.5400	0.2500	31.1350	60.0000	7472.4005	(29a)
Cold Roof-500mmRoof	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping Roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.7316			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20938.1606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		156.5236 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.5600	0.0500	0.5280
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	41.2400	0.0130	0.5361
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E13 Gable (insulation at rafter level)	2.4700	0.0390	0.0963

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.9675 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	68.6991 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	125.5274	(39)
Average = Sum(39)m / 12 =												125.5274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	0.9384	(40)
HLP (average)												0.9384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.9041 (42)

Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	35.2843	31.3392	25.4867	19.2951	14.4233	12.1768	13.1574	17.1025	22.9550	29.1466	34.0184	36.2649	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	706.6249	704.8760	682.6686	641.6739	599.0914	557.7914	535.1635	537.7088	559.1714	600.4133	646.2880	686.4904	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Southwest	2.2400	43.0593	0.6300	0.7000	0.7700	29.4772	(79)
Northwest	2.0800	13.7804	0.6300	0.7000	0.7700	8.7599	(81)
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)

Solar gains	182.8886	282.1680	409.9509	561.5458	653.4839	705.0185	665.2930	594.0652	489.3724	342.4487	217.8242	156.0883	(83)
Total gains	889.5136	987.0440	1092.6194	1203.2198	1252.5753	1262.8099	1200.4565	1131.7740	1048.5439	942.8620	864.1123	842.5787	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	46.3338	
alpha	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	4.0889	
util living area	0.9793	0.9669	0.9353	0.8576	0.7122	0.4995	0.3421	0.3727	0.6541	0.8851	0.9636	0.9828	(86)
MIT	19.6464	19.8372	20.1753	20.5650	20.8499	20.9735	20.9958	20.9940	20.9189	20.5692	20.0382	19.5946	(87)
Th 2	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	20.1350	(88)
util rest of house	0.9751	0.9602	0.9220	0.8289	0.6586	0.4230	0.2539	0.2800	0.5794	0.8552	0.9549	0.9792	(89)
MIT 2	18.5599	18.8004	19.2220	19.6912	20.0064	20.1195	20.1337	20.1330	20.0777	19.7063	19.0568	18.4946	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.7742	19.0050	19.4100	19.8636	20.1728	20.2880	20.3038	20.3029	20.2437	19.8765	19.2504	18.7116	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6242	18.8550	19.2600	19.7136	20.0228	20.1380	20.1538	20.1529	20.0937	19.7265	19.1004	18.5616	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9648	0.9471	0.9053	0.8128	0.6511	0.4232	0.2558	0.2820	0.5755	0.8382	0.9410	0.9700	(94)
Useful gains	858.2136	934.8188	989.1220	978.0159	815.4978	534.4579	307.1336	319.1345	603.4856	790.3398	813.1013	817.2991	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1697.6593	1651.3074	1488.7610	1231.8701	894.1053	544.5341	308.0139	320.4564	639.3975	1032.6525	1393.4104	1689.7972	(97)
Space heating kWh	624.5476	481.4803	371.7314	182.7750	58.4839	0.0000	0.0000	0.0000	0.0000	180.2807	417.8226	649.1386	(98a)
Space heating requirement - total per year (kWh/year)												2966.2602	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	624.5476	481.4803	371.7314	182.7750	58.4839	0.0000	0.0000	0.0000	0.0000	180.2807	417.8226	649.1386	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2966.2602	
Space heating per m2											(98c) / (4) =	22.1743	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	624.5476	481.4803	371.7314	182.7750	58.4839	0.0000	0.0000	0.0000	0.0000	180.2807	417.8226	649.1386	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	707.3019	545.2778	420.9869	206.9932	66.2332	0.0000	0.0000	0.0000	0.0000	204.1684	473.1853	735.1513	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0524	88.0266	87.9599	87.8224	87.5666	87.3000	87.3000	87.3000	87.3000	87.8161	87.9975	88.0616	(217)
Fuel for water heating, kWh/month	230.7749	203.4482	215.3102	188.1146	181.6811	162.9741	160.3261	167.6338	170.4392	190.3346	203.5472	228.1119	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.8841	24.7764	22.3084	16.3441	12.6246	10.3144	11.5166	14.9697	19.4442	25.5118	28.8156	31.7425	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.8541	-34.7097	-58.1255	-75.6236	-87.1938	-86.8324	-84.8252	-77.3007	-62.7694	-45.5067	-27.3095	-19.9833	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.4912	-15.3098	-36.7094	-66.6984	-94.0631	-105.6546	-101.6017	-82.8339	-53.2284	-26.2562	-10.3057	-5.7010	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3359.2981	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2302.6959	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	249.2524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1289.8871	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5010.6933	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3359.2981	7.3200	245.9006	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.6959	7.3200	168.5573	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	249.2524	27.6700	68.9681	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-684.0338	27.6700	-189.2721	
PV Unit electricity exported	-605.8534	5.8100	-35.2001	
Total			-224.4722	(252)
Total energy cost			474.6826	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3359.2981	0.2100	705.4526	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.6959	0.2100	483.5661	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1189.0187	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	249.2524	0.1443	35.9748	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-684.0338	0.1321	-90.3797	
PV Unit electricity exported	-605.8534	0.1217	-73.7338	
Total			-164.1135	(269)
Total CO2, kg/year			1114.9762	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3359.2981	1.1300	3796.0068	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.6959	1.1300	2602.0463	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6398.0532	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	249.2524	1.5338	382.3116	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-684.0338	1.4882	-1017.9600	
PV Unit electricity exported	-605.8534	0.4465	-270.4859	
Total			-1288.4459	(283)
Total Primary energy kWh/year			6081.2432	(286)

Summary for Input Data

elmhurst energy

Plot Reference	Plot 55	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 ET
Plot Address	12 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	91 B	**DER**	10.07	**TER**	10.48
Environmental	91 B	**% DER < TER**			3.91
CO_2 Emissions (t/year)	1.11	**DFEE**	36.44	**TFEE**	38.02
Compliance Check	See BREL	**% DFEE < TFEE**			4.14
% DPER < TPER	0.41	**DPER**	54.59	**TPER**	54.82

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, End-Terrace	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Very little	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	155.25	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	19.44 m	47.23 m²	2.40 m
1st Storey:	18.60 m	43.27 m²	2.67 m
2nd Storey:	18.60 m	43.27 m²	2.67 m

8.0 Living Area	26.39	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.25	60.00	145.98	121.71	0.00	None	24.27	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	75.19	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	76.62
Internal Wall 2	Plasterboard on timber frame	9.00	86.39
Internal Wall 3	Plasterboard on timber frame	9.00	70.08

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof-500mm	External Plane Roof	Plasterboard, insulated at ceiling level	0.08	9.00	32.20	32.20	None	0.00	Enter Gross Area	0.00
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.91	3.91	None	0.00	Enter Gross Area	0.00
Sloping roof	External Slope Roof	Plasterboard, insulated slope	0.12	9.00	10.21	10.21	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.23
Internal Ceiling 2	+2	Plasterboard ceiling, carpeted chipboard floor	9.00	43.27

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground FLoor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	47.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27
Internal Floor 2	+2	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.20
Patio Door	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Front Door	Brickwork	South East	2.15	
Patio Door	Patio Door	Brickwork	North West	5.85	
NW	Window	Brickwork	North West	7.16	
SE	Window	Brickwork	South East	9.12	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	11.93	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.30	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	45.31	0.01	0.01	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.44	0.07	0.07	RCD	Yes
E6 Intermediate floor within a dwelling	Gov Approved Scheme	37.22	0.00	0.00	RCD	No
E16 Corner (normal)	Gov Approved Scheme	16.00	0.05	0.05	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	16.00	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.97	0.06	0.06	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	18.28	0.00	0.00		No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	9.97	0.04	0.04	RCD	No
E11 Eaves (insulation at rafter level)	Gov Approved Scheme	9.13	0.01	0.01	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.12	0.04	0.04	RCD	No
E15 Flat roof with parapet	Independently assessed	6.41	0.09	0.09	AbbeyCalculated	No
E13 Gable (insulation at rafter level)	Non Gov Approved Schemes	2.37	0.04	0.04	RCD	No
E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	4.30	0.15	0.15		No

Y-value	0.03	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500755
Duct Type	Rigid
Wet Rooms	4

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	1
0.15	In Room Fan Other Wet Room	3
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0

0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.07	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
PD	106.00	8.00	848.00	12
DL	106.00	8.00	848.00	26

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	16636	
Fuel Type	Mains gas	
In Winter	88.30	
In Summer	87.30	
Model Name	Logic Code Combi	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	Standard Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

Summary for Input Data

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1
Ensuite 1	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 2
Ensuite 2	Instantaneous electric shower		9.30	No	

28.3 Waste Water Heat Recovery System
Instantaneous System 1

Database ID	80116
Brand Model	Showersave, QB1-21
Details	Year: 2017 + current Efficiency: 69.85 Utilisation factor: 0.973

29.0 Hot Water Cylinder None

32.0 Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
1.62	South	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations
Lower cost measures
None
Further measures to achieve even higher standards
None

Full SAP Calculation Printout

Plot Reference	Plot 55	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 ET
Plot Address	12 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	91 B	**DER**	10.07	**TER**	10.48
Environmental	91 B	**% DER < TER**			3.91
CO_2 Emissions (t/year)	1.11	**DFEE**	36.44	**TFEE**	38.02
Compliance Check	See BREL	**% DFEE < TFEE**			4.14
% DPER < TPER	0.41	**DPER**	54.59	**TPER**	54.82

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0700	(17)
Infiltration rate		0.1535	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1305	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1664	0.1631	0.1598	0.1435	0.1403	0.1240	0.1240	0.1207	0.1305	0.1403	0.1468	0.1533	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.2357	20.1179			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	69.3261			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924
E24 Eaves (insulation at ceiling level - inverted)	4.3000	0.1500	0.6450

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7300 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 76.0562 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	(39)
Average = Sum(39)m / 12 =												132.8845	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	(40)
HLP (average)												0.9934	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
12Total per year (kWh/year)												2020	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.6460	651.2265	621.8349	600.5850	568.0674	544.1116	521.8038	521.9486	538.9333	560.4304	596.2403	619.0985	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986 (83)
Total gains	781.0587	917.2259	1025.3669	1166.9228	1262.9669	1260.6216	1201.5114	1101.6713	998.2034	865.0882	775.5203	743.4971 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	
alpha	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	
util living area	0.9888	0.9786	0.9580	0.9006	0.7869	0.6191	0.4711	0.5285	0.7606	0.9329	0.9800	0.9907	(86)
MIT	19.2743	19.5187	19.8734	20.3357	20.7114	20.9166	20.9777	20.9653	20.8119	20.3142	19.7033	19.2158	(87)
Th 2	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	(88)
util rest of house	0.9865	0.9742	0.9491	0.8794	0.7433	0.5475	0.3800	0.4342	0.6974	0.9140	0.9751	0.9888	(89)
MIT 2	18.0570	18.3673	18.8146	19.3838	19.8195	20.0289	20.0781	20.0707	19.9363	19.3692	18.6045	17.9826	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.2971	18.5944	19.0235	19.5716	19.9955	20.2040	20.2555	20.2472	20.1091	19.5556	18.8213	18.2259	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1471	18.4444	18.8735	19.4216	19.8455	20.0540	20.1055	20.0972	19.9591	19.4056	18.6713	18.0759	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9631	0.9336	0.8607	0.7303	0.5446	0.3817	0.4351	0.6873	0.8958	0.9643	0.9824	(94)
Useful gains	764.8353	883.3960	957.2550	1004.3653	922.2957	686.5163	458.6378	479.3449	686.0719	774.9763	747.8071	730.4308	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1840.0696	1799.8459	1644.2434	1398.1590	1082.4049	724.7509	465.8319	491.3018	778.5806	1170.1292	1537.6460	1843.8859	(97)
Space heating kWh	799.9743	615.8543	511.1194	283.5315	119.1212	0.0000	0.0000	0.0000	0.0000	293.9938	568.6840	828.4105	(98a)
Space heating requirement - total per year (kWh/year)												4020.6891	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	799.9743	615.8543	511.1194	283.5315	119.1212	0.0000	0.0000	0.0000	0.0000	293.9938	568.6840	828.4105	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4020.6891	
Space heating per m2										(98c) / (4) =		30.0567	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	799.9743	615.8543	511.1194	283.5315	119.1212	0.0000	0.0000	0.0000	0.0000	293.9938	568.6840	828.4105	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	905.9732	697.4568	578.8442	321.1002	134.9051	0.0000	0.0000	0.0000	0.0000	332.9488	644.0362	938.1773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0956	88.0727	88.0274	87.9292	87.7254	87.3000	87.3000	87.3000	87.3000	87.9349	88.0584	88.1030	(217)
Fuel for water heating, kWh/month	230.6618	203.3417	215.1452	187.8861	181.3522	162.9741	160.3261	167.6338	170.4392	190.0773	203.4066	228.0046	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6991	-44.1757	-67.0999	-79.8758	-90.0131	-85.5051	-84.4585	-77.7704	-66.6211	-52.3995	-33.4555	-25.4097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8710	-23.5240	-48.2006	-74.6496	-100.8899	-102.1830	-100.7492	-84.0465	-60.1140	-34.1457	-14.6664	-8.5406	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4553.4417	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.2487	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1399.0639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	6087.3371	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4553.4417	0.2100	956.2228	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.2487	0.2100	483.2622	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1439.4850	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	0.1334	-98.2728	
PV Unit electricity exported	-662.5806	0.1251	-82.8740	
Total			-181.1468	(269)
Total CO2, kg/year			1347.4168	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.0700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4553.4417	1.1300	5145.3892	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.2487	1.1300	2600.4111	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7745.8002	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	1.4931	-1099.6344	
PV Unit electricity exported	-662.5806	0.4591	-304.1784	
Total			-1403.8128	(283)
Total Primary energy kWh/year			7303.0768	(286)
Dwelling Primary energy Rate (DPER)			54.5900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965	
E3 Sill	8.3020	0.0500	0.4151	
E4 Jamb	45.3100	0.0500	2.2655	
E5 Ground floor (normal)	19.4400	0.1600	3.1104	
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000	
E16 Corner (normal)	16.0000	0.0900	1.4400	
E18 Party wall between dwellings	16.0000	0.0600	0.9600	
P1 Party wall - Ground floor	9.9700	0.0800	0.7976	
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976	
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652	
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272	
E15 Flat roof with parapet	6.4100	0.5600	3.5896	
E13 Gable (insulation at rafter level)	2.3700	0.0800	0.1896	
E24 Eaves (insulation at ceiling level - inverted)	4.3000	0.2400	1.0320	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.9863 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	76.6171 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	142.3932	142.0457	141.7051	140.1055	139.8062	138.4129	138.4129	138.1549	138.9496	139.8062	140.4116	141.0446	(39)
Average = Sum(39)m / 12 =												140.1040	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0645	1.0619	1.0593	1.0474	1.0451	1.0347	1.0347	1.0328	1.0387	1.0451	1.0496	1.0544	(40)
HLP (average)												1.0474	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)
Average daily hot water use (litres/day)												136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
									Total per year (kWh/year) = Sum(64)m =			2561.6081	(64)

12Total per year (kWh/year) 2562 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)

Total internal gains

652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.5133	40.6124	40.7100	41.1749	41.2630	41.6783	41.6783	41.7562	41.5174	41.2630	41.0851	40.9007	
alpha	3.7009	3.7075	3.7140	3.7450	3.7509	3.7786	3.7786	3.7837	3.7678	3.7509	3.7390	3.7267	
util living area	0.9882	0.9782	0.9586	0.9041	0.7963	0.6300	0.4823	0.5386	0.7683	0.9338	0.9793	0.9901	(86)
MIT	19.1419	19.3936	19.7639	20.2642	20.6675	20.9022	20.9726	20.9588	20.7866	20.2567	19.6187	19.1047	(87)
Th 2	20.0300	20.0321	20.0342	20.0441	20.0459	20.0545	20.0545	20.0561	20.0512	20.0459	20.0422	20.0383	(88)
util rest of house	0.9857	0.9736	0.9497	0.8829	0.7522	0.5560	0.3866	0.4403	0.7041	0.9148	0.9742	0.9880	(89)
MIT 2	17.8501	18.1710	18.6398	19.2642	19.7356	19.9843	20.0414	20.0347	19.8785	19.2681	18.4663	17.8080	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.1050	18.4122	18.8615	19.4615	19.9195	20.1654	20.2251	20.2170	20.0576	19.4631	18.6937	18.0638	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1050	18.4122	18.8615	19.4615	19.9195	20.1654	20.2251	20.2170	20.0576	19.4631	18.6937	18.0638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9630	0.9354	0.8675	0.7457	0.5652	0.4044	0.4578	0.7046	0.9000	0.9640	0.9816	(94)
Useful gains	782.3575	900.9664	975.6423	1026.0447	952.9073	720.3428	491.1721	510.5247	713.1730	792.2178	763.8960	747.7683	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1965.7361	1919.3476	1751.6937	1479.7197	1149.1307	770.3251	501.7614	527.3390	827.8112	1239.1138	1627.8884	1955.4194	(97)
Space heating kWh	880.4337	684.3521	577.3822	326.6460	145.9902	0.0000	0.0000	0.0000	0.0000	332.4906	622.0745	898.4925	(98a)
Space heating requirement - total per year (kWh/year)												4467.8618	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	880.4337	684.3521	577.3822	326.6460	145.9902	0.0000	0.0000	0.0000	0.0000	332.4906	622.0745	898.4925	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4467.8618	
Space heating per m2											(98c) / (4) =	33.3996	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	880.4337	684.3521	577.3822	326.6460	145.9902	0.0000	0.0000	0.0000	0.0000	332.4906	622.0745	898.4925	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	952.8503	740.6409	624.8725	353.5130	157.9980	0.0000	0.0000	0.0000	0.0000	359.8384	673.2408	972.3944	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)

Efficiency of water heater

											80.3000	(216)
(217)m 86.8229	86.6136	86.2059	85.3270	83.6809	80.3000	80.3000	80.3000	80.3000	85.3379	86.4394	86.8712	(217)

Fuel for water heating, kWh/month

291.6617	258.4578	275.9708	245.7659	243.2643	228.8498	226.3471	235.2227	237.6393	248.8319	260.5305	288.4330	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting 32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m -45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m -23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	4835.3482	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3040.9750	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	264.9585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5892.8206	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4835.3482	0.2100	1015.4231	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3040.9750	0.2100	638.6047	(264)
Space and water heating			1654.0279	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1402.0308	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4835.3482	1.1300	5463.9435	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3040.9750	1.1300	3436.3017	(278)
Space and water heating			8900.2453	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			7333.0739	(286)
Target Primary Energy Rate (TPER)			54.8200	(287)

Full SAP Calculation Printout

Plot Reference	Plot 55	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 ET
Plot Address	12 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	91 B	**DER**	10.07	**TER**	10.48
Environmental	91 B	**% DER < TER**			3.91
CO_2 Emissions (t/year)	1.11	**DFEE**	36.44	**TFEE**	38.02
Compliance Check	See BREL	**% DFEE < TFEE**			4.14
% DPER < TPER	0.41	**DPER**	54.59	**TPER**	54.82

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0700	(17)
Infiltration rate		0.2696	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2292	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2922	0.2865	0.2808	0.2521	0.2464	0.2177	0.2177	0.2120	0.2292	0.2464	0.2578	0.2693	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5427	0.5410	0.5394	0.5318	0.5304	0.5237	0.5237	0.5225	0.5263	0.5304	0.5332	0.5363	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.2357	20.1179			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		69.3261			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)

Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924
E24 Eaves (insulation at ceiling level - inverted)	4.3000	0.1500	0.6450

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7300 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 76.0562 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.6810	61.4926	61.3079	60.4403	60.2780	59.5224	59.5224	59.3825	59.8134	60.2780	60.6064	60.9497	(38)

Heat transfer coeff

	137.7372	137.5488	137.3641	136.4965	136.3342	135.5786	135.5786	135.4387	135.8696	136.3342	136.6626	137.0059	(39)

Average = Sum(39)m / 12 = 136.4957

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0297	1.0282	1.0269	1.0204	1.0192	1.0135	1.0135	1.0125	1.0157	1.0192	1.0216	1.0242	(40)
HLP (average)												1.0204	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)

Energy content (annual) Total = Sum(45)m = 1154.6247
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)

Total per year (kWh/year) = Sum(64)m = 981.4310 (64)
12Total per year (kWh/year) 981 (64)
Electric shower(s)

58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 664.1943 (64a)
Heat gains from water heating, kWh/month

40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)

Total internal gains

580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.8828	41.9402	41.9966	42.2635	42.3138	42.5497	42.5497	42.5936	42.4585	42.3138	42.2122	42.1064	
alpha	3.7922	3.7960	3.7998	3.8176	3.8209	3.8366	3.8366	3.8396	3.8306	3.8209	3.8141	3.8071	
util living area	0.9912	0.9826	0.9649	0.9130	0.8067	0.6397	0.4901	0.5498	0.7821	0.9433	0.9839	0.9928	(86)
MIT	19.1356	19.3881	19.7589	20.2588	20.6666	20.9019	20.9728	20.9581	20.7817	20.2404	19.5995	19.0893	(87)
Th 2	20.0587	20.0599	20.0610	20.0664	20.0674	20.0721	20.0721	20.0730	20.0703	20.0674	20.0654	20.0632	(88)
util rest of house	0.9894	0.9789	0.9572	0.8935	0.7642	0.5666	0.3948	0.4519	0.7200	0.9266	0.9799	0.9913	(89)
MIT 2	18.3459	18.5970	18.9635	19.4501	19.8230	20.0168	20.0618	20.0558	19.9309	19.4421	18.8126	18.3030	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.5017	18.7531	19.1204	19.6096	19.9895	20.1914	20.2415	20.2338	20.0988	19.5996	18.9678	18.4582	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5017	18.7531	19.1204	19.6096	19.9895	20.1914	20.2415	20.2338	20.0988	19.5996	18.9678	18.4582	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9851	0.9721	0.9474	0.8821	0.7602	0.5765	0.4128	0.4697	0.7221	0.9161	0.9735	0.9875	(94)
Useful gains	717.2487	841.2553	924.6828	990.9629	929.6480	707.4895	483.1454	502.0262	695.6841	754.1795	708.8049	682.7139	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1956.0983	1905.4752	1733.5917	1461.8256	1130.1372	758.0698	493.7148	519.2446	815.0503	1226.9550	1621.8858	1953.4506	(97)
Space heating kWh	921.7041	715.1557	601.8283	339.0211	149.1640	0.0000	0.0000	0.0000	0.0000	351.7450	657.4183	945.4281	(98a)
Space heating requirement - total per year (kWh/year)												4681.4645	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	921.7041	715.1557	601.8283	339.0211	149.1640	0.0000	0.0000	0.0000	0.0000	351.7450	657.4183	945.4281	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4681.4645	
Space heating per m2											(98c) / (4) =	34.9964	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1274.4387	1003.2815	1029.3338	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8191	0.8818	0.8452	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1043.9182	884.7200	869.9460	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	230.0345	309.1974	234.2708	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	57.5086	77.2993	58.5677	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												193.3757	(107)
Energy for space heating												34.9964	(99)
Energy for space cooling												1.4456	(108)
Total												36.4420	(109)
Fabric Energy Efficiency (DFEE)												36.4	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E13 Gable (insulation at rafter level)	2.3700	0.0800	0.1896
E24 Eaves (insulation at ceiling level - inverted)	4.3000	0.2400	1.0320

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9863 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 76.6171 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	142.3932	142.0457	141.7051	140.1055	139.8062	138.4129	138.4129	138.1549	138.9496	139.8062	140.4116	141.0446	(39)

Average = Sum(39)m / 12 = 140.1040

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0645	1.0619	1.0593	1.0474	1.0451	1.0347	1.0347	1.0328	1.0387	1.0451	1.0496	1.0544	(40)
HLP (average)												1.0474	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)

Energy content (annual) Total = Sum(45)m = 1154.6247

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060 (64)
										Total per year (kWh/year) = Sum(64)m =		981.4310 (64)
12Total per year (kWh/year)												981 (64)

Electric shower(s)

	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				664.1943 (64a)

Heat gains from water heating, kWh/month

	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)

Total internal gains

	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.5133	40.6124	40.7100	41.1749	41.2630	41.6783	41.6783	41.7562	41.5174	41.2630	41.0851	40.9007	
alpha	3.7009	3.7075	3.7140	3.7450	3.7509	3.7786	3.7786	3.7837	3.7678	3.7509	3.7390	3.7267	
util living area	0.9913	0.9829	0.9659	0.9158	0.8130	0.6476	0.4982	0.5578	0.7884	0.9449	0.9841	0.9928	(86)
MIT	19.0619	19.3181	19.6970	20.2165	20.6401	20.8925	20.9695	20.9536	20.7652	20.2048	19.5489	19.0250	(87)
Th 2	20.0300	20.0321	20.0342	20.0441	20.0459	20.0545	20.0545	20.0561	20.0512	20.0459	20.0422	20.0383	(88)
util rest of house	0.9894	0.9792	0.9583	0.8966	0.7706	0.5734	0.4002	0.4575	0.7261	0.9284	0.9801	0.9912	(89)
MIT 2	18.2519	18.5074	18.8829	19.3926	19.7819	19.9939	20.0430	20.0371	19.9011	19.3916	18.7457	18.2212	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.4117	18.6674	19.0435	19.5551	19.9512	20.1712	20.2258	20.2179	20.0716	19.5520	18.9041	18.3798	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4117	18.6674	19.0435	19.5551	19.9512	20.1712	20.2258	20.2179	20.0716	19.5520	18.9041	18.3798	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9723	0.9483	0.8848	0.7659	0.5831	0.4186	0.4756	0.7277	0.9176	0.9736	0.9874	(94)
Useful gains	717.1832	841.4113	925.5350	993.9266	936.5736	715.5628	489.9590	508.3577	701.0055	755.4185	708.8911	682.6425	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2009.4128	1955.5941	1777.4748	1492.8418	1153.5645	771.1226	501.8561	527.4679	829.7501	1251.5459	1657.4378	1999.9820	(97)
Space heating kWh	961.4188	748.7309	633.8432	359.2189	161.4412	0.0000	0.0000	0.0000	0.0000	369.1187	682.9536	980.1006	(98a)
Space heating requirement - total per year (kWh/year)												4896.8259	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	961.4188	748.7309	633.8432	359.2189	161.4412	0.0000	0.0000	0.0000	0.0000	369.1187	682.9536	980.1006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4896.8259	
Space heating per m2											(98c) / (4) =	36.6063	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1301.0815	1024.2557	1049.9774	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8088	0.8733	0.8359	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1052.3397	894.5198	877.6431	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	223.9710	301.9064	228.5441	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	55.9928	75.4766	57.1360	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												188.6054	(107)
Energy for space heating												36.6063	(99)
Energy for space cooling												1.4099	(108)
Total												38.0162	(109)
Fabric Energy Efficiency (TFEE)												38.0	(109)

Full SAP Calculation Printout

Plot Reference	Plot 55	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 ET
Plot Address	12 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	91 B	**DER**	10.07	**TER**	10.48
Environmental	91 B	**% DER < TER**			3.91
CO_2 Emissions (t/year)	1.11	**DFEE**	36.44	**TFEE**	38.02
Compliance Check	See BREL	**% DFEE < TFEE**			4.14
% DPER < TPER	0.41	**DPER**	54.59	**TPER**	54.82

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0700	(17)
Infiltration rate		0.1535	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1305	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1664	0.1631	0.1598	0.1435	0.1403	0.1240	0.1240	0.1207	0.1305	0.1403	0.1468	0.1533	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.2357	20.1179			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	69.3261			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924
E24 Eaves (insulation at ceiling level - inverted)	4.3000	0.1500	0.6450

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7300 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 76.0562 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	(39)
Average = Sum(39)m / 12 =												132.8845	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	(40)
HLP (average)												0.9934	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
12Total per year (kWh/year)												2020	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.6460	651.2265	621.8349	600.5850	568.0674	544.1116	521.8038	521.9486	538.9333	560.4304	596.2403	619.0985	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986 (83)
Total gains	781.0587	917.2259	1025.3669	1166.9228	1262.9669	1260.6216	1201.5114	1101.6713	998.2034	865.0882	775.5203	743.4971 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	
alpha	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	
util living area	0.9888	0.9786	0.9580	0.9006	0.7869	0.6191	0.4711	0.5285	0.7606	0.9329	0.9800	0.9907	(86)
MIT	19.2743	19.5187	19.8734	20.3357	20.7114	20.9166	20.9777	20.9653	20.8119	20.3142	19.7033	19.2158	(87)
Th 2	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	(88)
util rest of house	0.9865	0.9742	0.9491	0.8794	0.7433	0.5475	0.3800	0.4342	0.6974	0.9140	0.9751	0.9888	(89)
MIT 2	18.0570	18.3673	18.8146	19.3838	19.8195	20.0289	20.0781	20.0707	19.9363	19.3692	18.6045	17.9826	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.2971	18.5944	19.0235	19.5716	19.9955	20.2040	20.2555	20.2472	20.1091	19.5556	18.8213	18.2259	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1471	18.4444	18.8735	19.4216	19.8455	20.0540	20.1055	20.0972	19.9591	19.4056	18.6713	18.0759	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9631	0.9336	0.8607	0.7303	0.5446	0.3817	0.4351	0.6873	0.8958	0.9643	0.9824	(94)
Useful gains	764.8353	883.3960	957.2550	1004.3653	922.2957	686.5163	458.6378	479.3449	686.0719	774.9763	747.8071	730.4308	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1840.0696	1799.8459	1644.2434	1398.1590	1082.4049	724.7509	465.8319	491.3018	778.5806	1170.1292	1537.6460	1843.8859	(97)
Space heating kWh	799.9743	615.8543	511.1194	283.5315	119.1212	0.0000	0.0000	0.0000	0.0000	293.9938	568.6840	828.4105	(98a)
Space heating requirement - total per year (kWh/year)												4020.6891	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	799.9743	615.8543	511.1194	283.5315	119.1212	0.0000	0.0000	0.0000	0.0000	293.9938	568.6840	828.4105	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4020.6891	
Space heating per m2										(98c) / (4) =		30.0567	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	799.9743	615.8543	511.1194	283.5315	119.1212	0.0000	0.0000	0.0000	0.0000	293.9938	568.6840	828.4105	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	905.9732	697.4568	578.8442	321.1002	134.9051	0.0000	0.0000	0.0000	0.0000	332.9488	644.0362	938.1773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0956	88.0727	88.0274	87.9292	87.7254	87.3000	87.3000	87.3000	87.3000	87.9349	88.0584	88.1030	(217)
Fuel for water heating, kWh/month	230.6618	203.3417	215.1452	187.8861	181.3522	162.9741	160.3261	167.6338	170.4392	190.0773	203.4066	228.0046	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6991	-44.1757	-67.0999	-79.8758	-90.0131	-85.5051	-84.4585	-77.7704	-66.6211	-52.3995	-33.4555	-25.4097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8710	-23.5240	-48.2006	-74.6496	-100.8899	-102.1830	-100.7492	-84.0465	-60.1140	-34.1457	-14.6664	-8.5406	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4553.4417	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.2487	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1399.0639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	6087.3371	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4553.4417	0.2100	956.2228	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.2487	0.2100	483.2622	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1439.4850	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	0.1334	-98.2728	
PV Unit electricity exported	-662.5806	0.1251	-82.8740	
Total			-181.1468	(269)
Total CO2, kg/year			1347.4168	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.0700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4553.4417	1.1300	5145.3892	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.2487	1.1300	2600.4111	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7745.8002	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	1.4931	-1099.6344	
PV Unit electricity exported	-662.5806	0.4591	-304.1784	
Total			-1403.8128	(283)
Total Primary energy kWh/year			7303.0768	(286)
Dwelling Primary energy Rate (DPER)			54.5900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965	
E3 Sill	8.3020	0.0500	0.4151	
E4 Jamb	45.3100	0.0500	2.2655	
E5 Ground floor (normal)	19.4400	0.1600	3.1104	
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000	
E16 Corner (normal)	16.0000	0.0900	1.4400	
E18 Party wall between dwellings	16.0000	0.0600	0.9600	
P1 Party wall - Ground floor	9.9700	0.0800	0.7976	
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976	
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652	
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272	
E15 Flat roof with parapet	6.4100	0.5600	3.5896	
E13 Gable (insulation at rafter level)	2.3700	0.0800	0.1896	
E24 Eaves (insulation at ceiling level - inverted)	4.3000	0.2400	1.0320	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.9863 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	76.6171 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	142.3932	142.0457	141.7051	140.1055	139.8062	138.4129	138.4129	138.1549	138.9496	139.8062	140.4116	141.0446	(39)
Average = Sum(39)m / 12 =												140.1040	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0645	1.0619	1.0593	1.0474	1.0451	1.0347	1.0347	1.0328	1.0387	1.0451	1.0496	1.0544	(40)
HLP (average)												1.0474	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)
Average daily hot water use (litres/day)												136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
									Total per year (kWh/year) = Sum(64)m =			2561.6081	(64)

12Total per year (kWh/year) 2562 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)

Total internal gains

652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.5133	40.6124	40.7100	41.1749	41.2630	41.6783	41.6783	41.7562	41.5174	41.2630	41.0851	40.9007	
alpha	3.7009	3.7075	3.7140	3.7450	3.7509	3.7786	3.7786	3.7837	3.7678	3.7509	3.7390	3.7267	
util living area	0.9882	0.9782	0.9586	0.9041	0.7963	0.6300	0.4823	0.5386	0.7683	0.9338	0.9793	0.9901	(86)
MIT	19.1419	19.3936	19.7639	20.2642	20.6675	20.9022	20.9726	20.9588	20.7866	20.2567	19.6187	19.1047	(87)
Th 2	20.0300	20.0321	20.0342	20.0441	20.0459	20.0545	20.0545	20.0561	20.0512	20.0459	20.0422	20.0383	(88)
util rest of house	0.9857	0.9736	0.9497	0.8829	0.7522	0.5560	0.3866	0.4403	0.7041	0.9148	0.9742	0.9880	(89)
MIT 2	17.8501	18.1710	18.6398	19.2642	19.7356	19.9843	20.0414	20.0347	19.8785	19.2681	18.4663	17.8080	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.1050	18.4122	18.8615	19.4615	19.9195	20.1654	20.2251	20.2170	20.0576	19.4631	18.6937	18.0638	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1050	18.4122	18.8615	19.4615	19.9195	20.1654	20.2251	20.2170	20.0576	19.4631	18.6937	18.0638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9630	0.9354	0.8675	0.7457	0.5652	0.4044	0.4578	0.7046	0.9000	0.9640	0.9816	(94)
Useful gains	782.3575	900.9664	975.6423	1026.0447	952.9073	720.3428	491.1721	510.5247	713.1730	792.2178	763.8960	747.7683	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1965.7361	1919.3476	1751.6937	1479.7197	1149.1307	770.3251	501.7614	527.3390	827.8112	1239.1138	1627.8884	1955.4194	(97)
Space heating kWh	880.4337	684.3521	577.3822	326.6460	145.9902	0.0000	0.0000	0.0000	0.0000	332.4906	622.0745	898.4925	(98a)
Space heating requirement - total per year (kWh/year)												4467.8618	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	880.4337	684.3521	577.3822	326.6460	145.9902	0.0000	0.0000	0.0000	0.0000	332.4906	622.0745	898.4925	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4467.8618	
Space heating per m2											(98c) / (4) =	33.3996	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	880.4337	684.3521	577.3822	326.6460	145.9902	0.0000	0.0000	0.0000	0.0000	332.4906	622.0745	898.4925	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	952.8503	740.6409	624.8725	353.5130	157.9980	0.0000	0.0000	0.0000	0.0000	359.8384	673.2408	972.3944	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)

Space heating fuel (main heating system 2)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)

Efficiency of water heater

											80.3000	(216)
(217)m 86.8229	86.6136	86.2059	85.3270	83.6809	80.3000	80.3000	80.3000	80.3000	85.3379	86.4394	86.8712	(217)

Fuel for water heating, kWh/month

291.6617	258.4578	275.9708	245.7659	243.2643	228.8498	226.3471	235.2227	237.6393	248.8319	260.5305	288.4330	(219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa 7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting 32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m -45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m -23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	4835.3482	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3040.9750	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	264.9585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5892.8206	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4835.3482	0.2100	1015.4231	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3040.9750	0.2100	638.6047	(264)
Space and water heating			1654.0279	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1402.0308	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4835.3482	1.1300	5463.9435	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3040.9750	1.1300	3436.3017	(278)
Space and water heating			8900.2453	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			7333.0739	(286)
Target Primary Energy Rate (TPER)			54.8200	(287)

Full SAP Calculation Printout

Plot Reference	Plot 55	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 ET
Plot Address	12 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	91 B	**DER**	10.07	**TER**	10.48
Environmental	91 B	**% DER < TER**			3.91
CO_2 Emissions (t/year)	1.11	**DFEE**	36.44	**TFEE**	38.02
Compliance Check	See BREL	**% DFEE < TFEE**			4.14
% DPER < TPER	0.41	**DPER**	54.59	**TPER**	54.82

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0700	(17)
Infiltration rate		0.1535	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1305	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1664	0.1631	0.1598	0.1435	0.1403	0.1240	0.1240	0.1207	0.1305	0.1403	0.1468	0.1533	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.2357	20.1179			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		69.3261			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924
E24 Eaves (insulation at ceiling level - inverted)	4.3000	0.1500	0.6450

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7300 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 76.0562 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)

Heat transfer coeff

	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	(39)

Average = Sum(39)m / 12 = 132.8845

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	(40)
HLP (average)												0.9934	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223 (42a)

Hot water usage for baths

	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717 (42b)

Hot water usage for other uses

	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714 (42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892

Distribution loss (46)m = 0.15 x (45)m

	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619 (46)

Water storage loss (or HIU loss):
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739 (61)

Total heat required for water heating calculated for each month

	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868 (62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h

	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790 (64)

Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)

Electric shower(s)

	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)

Heat gains from water heating, kWh/month

	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	33.3456	29.6172	24.0863	18.2349	13.6308	11.5077	12.4345	16.1628	21.6937	27.5451	32.1492	34.2723 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658 (71)

Water heating gains (Table 5)

	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568 (72)

Total internal gains

	704.6862	703.1540	681.2682	640.6138	598.2989	557.1223	534.4406	536.7691	557.9102	598.8118	644.4189	684.4979 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	11.2829	0.6300	0.7000	1.0000	26.1975	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	1.0000	133.1837	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	1.0000	32.0639	(81)

Solar gains	191.4450	345.4538	524.0675	735.5036	902.4669	930.5325	882.7372	752.8866	596.4546	395.6595	232.8312	161.5566	(83)
Total gains	896.1313	1048.6078	1205.3357	1376.1174	1500.7659	1487.6549	1417.1777	1289.6557	1154.3648	994.4713	877.2501	846.0545	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	
alpha	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	
util living area	0.9823	0.9673	0.9330	0.8525	0.7122	0.5420	0.4048	0.4600	0.6957	0.9027	0.9703	0.9857	(86)
MIT	19.4031	19.6580	20.0431	20.4815	20.8009	20.9474	20.9868	20.9785	20.8643	20.4224	19.8122	19.3319	(87)
Th 2	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	(88)
util rest of house	0.9788	0.9609	0.9200	0.8253	0.6645	0.4742	0.3243	0.3746	0.6294	0.8780	0.9634	0.9828	(89)
MIT 2	18.2202	18.5419	19.0224	19.5514	19.9090	20.0523	20.0827	20.0780	19.9828	19.4953	18.7407	18.1300	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.4535	18.7621	19.2238	19.7349	20.0850	20.2289	20.2610	20.2557	20.1567	19.6782	18.9521	18.3671	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3035	18.6121	19.0738	19.5849	19.9350	20.0789	20.1110	20.1057	20.0067	19.5282	18.8021	18.2171	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9690	0.9471	0.9021	0.8079	0.6558	0.4735	0.3263	0.3762	0.6228	0.8593	0.9501	0.9742	(94)
Useful gains	868.3588	993.1287	1087.3260	1111.8067	984.2092	704.3362	462.4088	485.1945	718.9945	854.5692	833.4444	824.2280	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1860.8525	1822.1201	1670.8611	1419.8528	1094.3019	728.0553	466.5622	492.4236	784.9065	1186.4206	1555.0233	1862.6529	(97)
Space heating kWh	738.4153	557.0823	434.1501	221.7932	81.9090	0.0000	0.0000	0.0000	0.0000	246.8974	519.5369	772.5881	(98a)
Space heating requirement - total per year (kWh/year)												3572.3722	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	738.4153	557.0823	434.1501	221.7932	81.9090	0.0000	0.0000	0.0000	0.0000	246.8974	519.5369	772.5881	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3572.3722	
Space heating per m2											(98c) / (4) =	26.7053	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	738.4153	557.0823	434.1501	221.7932	81.9090	0.0000	0.0000	0.0000	0.0000	246.8974	519.5369	772.5881	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	836.2575	630.8972	491.6762	251.1814	92.7621	0.0000	0.0000	0.0000	0.0000	279.6120	588.3770	874.9582	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0823	88.0546	87.9939	87.8703	87.6373	87.3000	87.3000	87.3000	87.3000	87.8936	88.0414	88.0918	(217)
Fuel for water heating, kWh/month	230.6967	203.3835	215.2272	188.0120	181.5344	162.9741	160.3261	167.6338	170.4392	190.1667	203.4457	228.0338	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	29.1872	23.4150	21.0826	15.4460	11.9310	9.7477	10.8838	14.1472	18.3758	24.1101	27.2323	29.9984	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6895	-44.1584	-67.0718	-79.8429	-89.9791	-85.4745	-84.4244	-77.7323	-66.5843	-52.3728	-33.4421	-25.4016	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8806	-23.5414	-48.2286	-74.6824	-100.9239	-102.2136	-100.7833	-84.0846	-60.1508	-34.1724	-14.6798	-8.5487	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	4045.7217	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.8732	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	235.5572	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1399.0639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5573.4223	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4045.7217	3.6400	147.2643	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.8732	3.6400	83.7882	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	235.5572	16.4900	38.8434	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.1738	16.4900	-121.3951	
PV Unit electricity exported	-662.8901	5.5900	-37.0556	
Total			-158.4506	(252)
Total energy cost			267.6464	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5390	(257)
SAP value		91.2632	
SAP rating (Section 12)		91	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4045.7217	0.2100	849.6015	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.8732	0.2100	483.3934	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1332.9949	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	235.5572	0.1443	33.9982	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.1738	0.1334	-98.2318	
PV Unit electricity exported	-662.8901	0.1251	-82.9150	
Total			-181.1468	(269)
Total CO2, kg/year			1239.9425	(272)
CO2 emissions per m2			9.2700	(273)
EI value			90.7058	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0700	(17)
Infiltration rate		0.1535	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1305	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1403	0.1337	0.1337	0.1240	0.1272	0.1109	0.1109	0.1076	0.1109	0.1240	0.1207	0.1305	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.2357	20.1179			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		69.3261			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924
E24 Eaves (insulation at ceiling level - inverted)	4.3000	0.1500	0.6450

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.7300	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	76.0562	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	(39)
Average = Sum(39)m / 12 =												132.8845	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	(40)
HLP (average)												0.9934	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses													

	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714 (42c)
Average daily hot water use (litres/day)												114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)											Total = Sum(45)m =	1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month													
	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month													
	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	33.3456	29.6172	24.0863	18.2349	13.6308	11.5077	12.4345	16.1628	21.6937	27.5451	32.1492	34.2723	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains													
	704.6862	703.1540	681.2682	640.6138	598.2989	557.1223	534.4406	536.7691	557.9102	598.8118	644.4189	684.4979	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	13.7804	0.6300	0.7000	1.0000	31.9963	(81)
Southeast	9.1200	43.0593	0.6300	0.7000	1.0000	155.8629	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	1.0000	39.1612	(81)

Solar gains	227.0204	359.1825	544.1198	779.8545	934.9897	1020.4777	958.2804	836.4391	661.8403	442.4599	272.2283	192.5312	(83)
Total gains	931.7066	1062.3365	1225.3880	1420.4682	1533.2886	1577.6001	1492.7210	1373.2082	1219.7505	1041.2716	916.6472	877.0290	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	
alpha	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	
util living area													
	0.9765	0.9602	0.9166	0.8104	0.6379	0.4279	0.2920	0.3261	0.6043	0.8644	0.9583	0.9807	(86)
MIT	19.5651	19.7917	20.1842	20.6137	20.8828	20.9811	20.9969	20.9952	20.9281	20.5679	19.9873	19.5058	(87)
Th 2	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	(88)
util rest of house													
	0.9717	0.9522	0.9002	0.7762	0.5818	0.3569	0.2123	0.2401	0.5281	0.8305	0.9484	0.9766	(89)
MIT 2	18.4260	18.7107	19.1966	19.7040	19.9920	20.0782	20.0879	20.0873	20.0397	19.6655	18.9607	18.3513	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6507	18.9240	19.3914	19.8835	20.1677	20.2563	20.2672	20.2665	20.2150	19.8436	19.1633	18.5791	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5007	18.7740	19.2414	19.7335	20.0177	20.1063	20.1172	20.1165	20.0650	19.6936	19.0133	18.4291	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9601	0.9371	0.8816	0.7612	0.5771	0.3582	0.2148	0.2428	0.5260	0.8130	0.9328	0.9662	(94)
Useful gains	894.4916	995.5333	1080.3461	1081.2772	884.8792	565.1658	320.5778	333.3633	641.5596	846.5920	855.0144	847.4083	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1780.7508	1737.3261	1573.5370	1306.7194	945.8347	572.2436	321.2142	334.3973	673.0600	1088.7957	1463.4900	1771.2280	(97)
Space heating kWh													
	659.3768	498.4847	366.9340	162.3184	45.3509	0.0000	0.0000	0.0000	0.0000	180.1995	438.1024	687.3218	(98a)
Space heating requirement - total per year (kWh/year)												3038.0888	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

659.3768	498.4847	366.9340	162.3184	45.3509	0.0000	0.0000	0.0000	0.0000	180.1995	438.1024	687.3218	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 3038.0888

Space heating per m2 (98c) / (4) = 22.7113 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 88.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	659.3768	498.4847	366.9340	162.3184	45.3509	0.0000	0.0000	0.0000	0.0000	180.1995	438.1024	687.3218	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	746.7461	564.5354	415.5538	183.8261	51.3601	0.0000	0.0000	0.0000	0.0000	204.0765	496.1522	778.3939	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0624	88.0335	87.9570	87.7927	87.5199	87.3000	87.3000	87.3000	87.3000	87.8159	88.0074	88.0718	(217)
Fuel for water heating, kWh/month													
	230.7488	203.4324	215.3173	188.1781	181.7781	162.9741	160.3261	167.6338	170.4392	190.3348	203.5243	228.0854	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	29.1872	23.4150	21.0826	15.4460	11.9310	9.7477	10.8838	14.1472	18.3758	24.1101	27.2323	29.9984	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.4132	-45.6747	-68.8976	-82.7132	-91.5702	-89.8764	-88.2556	-82.6330	-71.2249	-56.9769	-38.1233	-29.6407	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.0244	-25.0228	-50.7820	-80.3340	-104.8722	-114.5103	-111.4019	-96.0779	-69.0789	-40.0705	-18.4910	-11.1162	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 3440.6441 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 87.3000

Water heating fuel used 2302.7724 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)

mechanical ventilation fans (SFP = 0.1950) 81.9360 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 167.9360 (231)

Electricity for lighting (calculated in Appendix L) 235.5572 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -1515.7821 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (235)

Appendix Q - special features

Energy saved or generated -0.0000 (236)

Energy used 0.0000 (237)

Total delivered energy for all uses 4852.5257 (238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3440.6441	7.3200	251.8552	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.7724	7.3200	168.5629	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	235.5572	27.6700	65.1787	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-779.9999	27.6700	-215.8260	
PV Unit electricity exported	-735.7822	5.8100	-42.7489	
Total			-258.5749	(252)
Total energy cost			442.7506	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy	Emission factor	Emissions

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	3440.6441	0.2100	722.5353	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.7724	0.2100	483.5822	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1206.1175	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	235.5572	0.1443	33.9982	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-779.9999	0.1336	-104.2367	
PV Unit electricity exported	-735.7822	0.1250	-91.9752	
Total			-196.2119	(269)
Total CO2, kg/year			1097.9999	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3440.6441	1.1300	3887.9279	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.7724	1.1300	2602.1329	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6490.0607	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	235.5572	1.5338	361.3054	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-779.9999	1.4938	-1165.1883	
PV Unit electricity exported	-735.7822	0.4587	-337.5248	
Total			-1502.7131	(283)
Total Primary energy kWh/year			5937.9774	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: B 91
Current environmental impact rating: B 91

N Solar water heating		SAP increase too small
U Solar photovoltaic panels		Already installed
V2 Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.4	-£ 34	-146 kg (13.3%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 91
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£173	£173	£0
Mains gas	£528	£528	£0
Space heating	£406	£406	£0
Water heating	£230	£230	£0
Lighting	£65	£65	£0
Generated (PV)	-£259	-£259	£0
Total cost of fuels	£442	£442	£0
Total cost of uses	£442	£442	£0
Delivered energy	36 kWh/m²	36 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	44 kWh/m²	44 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520 (1b) - (3b)	
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309 (1c) - (3c)	

Second floor	43.2700 (1d) x	2.6700 (2d) =	115.5309 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.4138 (5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0700 (17)
Infiltration rate		0.1535 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1305 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.1664	0.1631	0.1598	0.1435	0.1403	0.1240	0.1240	0.1207	0.1305	0.1403	0.1468	0.1533	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.2357	20.1179			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		69.3261			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965	
E3 Sill	8.3020	0.0170	0.1411	
E4 Jamb	45.3100	0.0130	0.5890	
E5 Ground floor (normal)	19.4400	0.0660	1.2830	
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117	
E16 Corner (normal)	16.0000	0.0490	0.7840	
E18 Party wall between dwellings	16.0000	0.0400	0.6400	
P1 Party wall - Ground floor	9.9700	0.0580	0.5783	
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589	
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548	
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848	
E15 Flat roof with parapet	6.4100	0.0890	0.5705	
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924	
E24 Eaves (insulation at ceiling level - inverted)	4.3000	0.1500	0.6450	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.7300 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 76.0562 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	(39)
Average = Sum(39)m / 12 =												132.8845	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	(40)
HLP (average)												0.9934	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9041	(42)
Hot water usage for mixer showers													
	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths													
	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses													
	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)
Average daily hot water use (litres/day)												114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month													
	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						221.3981	(64a)
Heat gains from water heating, kWh/month													
	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	33.3456	29.6172	24.0863	18.2349	13.6308	11.5077	12.4345	16.1628	21.6937	27.5451	32.1492	34.2723	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains													
	704.6862	703.1540	681.2682	640.6138	598.2989	557.1223	534.4406	536.7691	557.9102	598.8118	644.4189	684.4979	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	11.2829	0.6300	0.7000	1.0000	26.1975	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	1.0000	133.1837	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	1.0000	32.0639	(81)

Solar gains	191.4450	345.4538	524.0675	735.5036	902.4669	930.5325	882.7372	752.8866	596.4546	395.6595	232.8312	161.5566	(83)
Total gains	896.1313	1048.6078	1205.3357	1376.1174	1500.7659	1487.6549	1417.1777	1289.6557	1154.3648	994.4713	877.2501	846.0545	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	
alpha	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	
util living area													
	0.9823	0.9673	0.9330	0.8525	0.7122	0.5420	0.4048	0.4600	0.6957	0.9027	0.9703	0.9857	(86)
MIT	19.4031	19.6580	20.0431	20.4815	20.8009	20.9474	20.9868	20.9785	20.8643	20.4224	19.8122	19.3319	(87)
Th 2	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	(88)
util rest of house													
	0.9788	0.9609	0.9200	0.8253	0.6645	0.4742	0.3243	0.3746	0.6294	0.8780	0.9634	0.9828	(89)
MIT 2	18.2202	18.5419	19.0224	19.5514	19.9090	20.0523	20.0827	20.0780	19.9828	19.4953	18.7407	18.1300	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.4535	18.7621	19.2238	19.7349	20.0850	20.2289	20.2610	20.2557	20.1567	19.6782	18.9521	18.3671	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3035	18.6121	19.0738	19.5849	19.9350	20.0789	20.1110	20.1057	20.0067	19.5282	18.8021	18.2171	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9690	0.9471	0.9021	0.8079	0.6558	0.4735	0.3263	0.3762	0.6228	0.8593	0.9501	0.9742	(94)
Useful gains	868.3588	993.1287	1087.3260	1111.8067	984.2092	704.3362	462.4088	485.1945	718.9945	854.5692	833.4444	824.2280	(95)

Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1860.8525	1822.1201	1670.8611	1419.8528	1094.3019	728.0553	466.5622	492.4236	784.9065	1186.4206	1555.0233	1862.6529	(97)
Space heating kWh	738.4153	557.0823	434.1501	221.7932	81.9090	0.0000	0.0000	0.0000	0.0000	246.8974	519.5369	772.5881	(98a)
Space heating requirement - total per year (kWh/year)												3572.3722	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	738.4153	557.0823	434.1501	221.7932	81.9090	0.0000	0.0000	0.0000	0.0000	246.8974	519.5369	772.5881	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3572.3722	
Space heating per m2											(98c) / (4) =	26.7053	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												88.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	738.4153	557.0823	434.1501	221.7932	81.9090	0.0000	0.0000	0.0000	0.0000	246.8974	519.5369	772.5881	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	836.2575	630.8972	491.6762	251.1814	92.7621	0.0000	0.0000	0.0000	0.0000	279.6120	588.3770	874.9582	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0823	88.0546	87.9939	87.8703	87.6373	87.3000	87.3000	87.3000	87.3000	87.8936	88.0414	88.0918	(217)
Fuel for water heating, kWh/month	230.6967	203.3835	215.2272	188.0120	181.5344	162.9741	160.3261	167.6338	170.4392	190.1667	203.4457	228.0338	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	29.1872	23.4150	21.0826	15.4460	11.9310	9.7477	10.8838	14.1472	18.3758	24.1101	27.2323	29.9984	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6895	-44.1584	-67.0718	-79.8429	-89.9791	-85.4745	-84.4244	-77.7323	-66.5843	-52.3728	-33.4421	-25.4016	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8806	-23.5414	-48.2286	-74.6824	-100.9239	-102.2136	-100.7833	-84.0846	-60.1508	-34.1724	-14.6798	-8.5487	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4045.7217	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2301.8732	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)													
mechanical ventilation fans (SFP = 0.1950)												81.9360	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												167.9360	(231)
Electricity for lighting (calculated in Appendix L)												235.5572	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1399.0639	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												5573.4223	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4045.7217	3.6400	147.2643	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.8732	3.6400	83.7882	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	235.5572	16.4900	38.8434	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.1738	16.4900	-121.3951	
PV Unit electricity exported	-662.8901	5.5900	-37.0556	
Total			-158.4506	(252)
Total energy cost			267.6464	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5390 (257)
SAP value		91.2632
SAP rating (Section 12)		91 (258)
SAP band		B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4045.7217	0.2100	849.6015	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.8732	0.2100	483.3934	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1332.9949	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	235.5572	0.1443	33.9982	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.1738	0.1334	-98.2318	
PV Unit electricity exported	-662.8901	0.1251	-82.9150	
Total			-181.1468	(269)
Total CO2, kg/year			1239.9425	(272)
CO2 emissions per m2			9.2700	(273)
EI value			90.7058	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0700	(17)
Infiltration rate		0.1535	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1305	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1403	0.1337	0.1337	0.1240	0.1272	0.1109	0.1109	0.1076	0.1109	0.1240	0.1207	0.1305	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							

Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.2357	20.1179			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		69.3261			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924
E24 Eaves (insulation at ceiling level - inverted)	4.3000	0.1500	0.6450

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.7300 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	76.0562 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	132.8845	(39)
Average = Sum(39)m / 12 =												132.8845	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	0.9934	(40)
HLP (average)												0.9934	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9041 (42)
Hot water usage for mixer showers	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223 (42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717 (42b)
Hot water usage for other uses	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714 (42c)
Average daily hot water use (litres/day)												114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
									Total per year (kWh/year) = Sum(64)m =			2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.3456	29.6172	24.0863	18.2349	13.6308	11.5077	12.4345	16.1628	21.6937	27.5451	32.1492	34.2723	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains													
	704.6862	703.1540	681.2682	640.6138	598.2989	557.1223	534.4406	536.7691	557.9102	598.8118	644.4189	684.4979	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	13.7804	0.6300	0.7000	1.0000	31.9963	(81)
Southeast	9.1200	43.0593	0.6300	0.7000	1.0000	155.8629	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	1.0000	39.1612	(81)

Solar gains	227.0204	359.1825	544.1198	779.8545	934.9897	1020.4777	958.2804	836.4391	661.8403	442.4599	272.2283	192.5312	(83)
Total gains	931.7066	1062.3365	1225.3880	1420.4682	1533.2886	1577.6001	1492.7210	1373.2082	1219.7505	1041.2716	916.6472	877.0290	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	43.4123	
alpha	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	3.8942	
util living area	0.9765	0.9602	0.9166	0.8104	0.6379	0.4279	0.2920	0.3261	0.6043	0.8644	0.9583	0.9807	(86)
MIT	19.5651	19.7917	20.1842	20.6137	20.8828	20.9811	20.9969	20.9952	20.9281	20.5679	19.9873	19.5058	(87)
Th 2	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	20.0889	(88)
util rest of house	0.9717	0.9522	0.9002	0.7762	0.5818	0.3569	0.2123	0.2401	0.5281	0.8305	0.9484	0.9766	(89)
MIT 2	18.4260	18.7107	19.1966	19.7040	19.9920	20.0782	20.0879	20.0873	20.0397	19.6655	18.9607	18.3513	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6507	18.9240	19.3914	19.8835	20.1677	20.2563	20.2672	20.2665	20.2150	19.8436	19.1633	18.5791	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5007	18.7740	19.2414	19.7335	20.0177	20.1063	20.1172	20.1165	20.0650	19.6936	19.0133	18.4291	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9601	0.9371	0.8816	0.7612	0.5771	0.3582	0.2148	0.2428	0.5260	0.8130	0.9328	0.9662	(94)
Useful gains	894.4916	995.5333	1080.3461	1081.2772	884.8792	565.1658	320.5778	333.3633	641.5596	846.5920	855.0144	847.4083	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1780.7508	1737.3261	1573.5370	1306.7194	945.8347	572.2436	321.2142	334.3973	673.0600	1088.7957	1463.4900	1771.2280	(97)
Space heating kWh	659.3768	498.4847	366.9340	162.3184	45.3509	0.0000	0.0000	0.0000	0.0000	180.1995	438.1024	687.3218	(98a)
Space heating requirement - total per year (kWh/year)												3038.0888	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	659.3768	498.4847	366.9340	162.3184	45.3509	0.0000	0.0000	0.0000	0.0000	180.1995	438.1024	687.3218	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3038.0888	
Space heating per m2											(98c) / (4) =	22.7113	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	659.3768	498.4847	366.9340	162.3184	45.3509	0.0000	0.0000	0.0000	0.0000	180.1995	438.1024	687.3218	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	746.7461	564.5354	415.5538	183.8261	51.3601	0.0000	0.0000	0.0000	0.0000	204.0765	496.1522	778.3939	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0624	88.0335	87.9570	87.7927	87.5199	87.3000	87.3000	87.3000	87.3000	87.8159	88.0074	88.0718	(217)
Fuel for water heating, kWh/month	230.7488	203.4324	215.3173	188.1781	181.7781	162.9741	160.3261	167.6338	170.4392	190.3348	203.5243	228.0854	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	29.1872	23.4150	21.0826	15.4460	11.9310	9.7477	10.8838	14.1472	18.3758	24.1101	27.2323	29.9984	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.4132	-45.6747	-68.8976	-82.7132	-91.5702	-89.8764	-88.2556	-82.6330	-71.2249	-56.9769	-38.1233	-29.6407	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.0244	-25.0228	-50.7820	-80.3340	-104.8722	-114.5103	-111.4019	-96.0779	-69.0789	-40.0705	-18.4910	-11.1162	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3440.6441	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2302.7724	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	235.5572	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1515.7821	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4852.5257	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3440.6441	7.3200	251.8552	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.7724	7.3200	168.5629	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	235.5572	27.6700	65.1787	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-779.9999	27.6700	-215.8260	
PV Unit electricity exported	-735.7822	5.8100	-42.7489	
Total			-258.5749	(252)
Total energy cost			442.7506	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3440.6441	0.2100	722.5353	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.7724	0.2100	483.5822	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1206.1175	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	235.5572	0.1443	33.9982	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-779.9999	0.1336	-104.2367	
PV Unit electricity exported	-735.7822	0.1250	-91.9752	
Total			-196.2119	(269)
Total CO2, kg/year			1097.9999	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3440.6441	1.1300	3887.9279	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.7724	1.1300	2602.1329	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6490.0607	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	235.5572	1.5338	361.3054	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-779.9999	1.4938	-1165.1883	
PV Unit electricity exported	-735.7822	0.4587	-337.5248	
Total			-1502.7131	(283)
Total Primary energy kWh/year			5937.9774	(286)

Summary for Input Data

Plot Reference	Plot 56	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	14 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.99	**TER**	9.21
Environmental	92 A	**% DER < TER**			13.25
CO_2 Emissions (t/year)	0.9	**DFEE**	28.88	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			10.41
% DPER < TPER	10.23	**DPER**	43.09	**TPER**	48.00

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, Mid-Terrace	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	147.93	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	9.47 m	47.23 m²	2.40 m
1st Storey:	9.47 m	43.27 m²	2.67 m
2nd Storey:	9.47 m	43.27 m²	2.67 m

8.0 Living Area	26.39	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.25	60.00	73.30	49.03	0.00	None	24.27	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	150.34	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	70.08
Internal Wall 2	Plasterboard on timber frame	9.00	86.39
Internal Wall 3	Plasterboard on timber frame	9.00	76.62

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof-500mm	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	32.20	32.20	None	0.00	Enter Gross Area	0.00
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.91	3.91	None	0.00	Enter Gross Area	0.00
Sloping	External Slope Roof	Plasterboard, insulated slope	0.14	9.00	10.21	10.21	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.23
Internal Ceiling 2	+2	Plasterboard ceiling, carpeted chipboard floor	9.00	43.27

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground FLoor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	47.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27
Internal Floor 2	+2	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Front Door	Brickwork	South East	2.15	
Patio Door	Patio Door	Brickwork	North West	5.85	
NW	Window	Brickwork	North West	7.16	
SE	Window	Brickwork	South East	9.12	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging — Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	11.93	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.30	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	45.31	0.01	0.01	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	9.47	0.07	0.07	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	18.95	0.00	0.00	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	30.96	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	19.94	0.06	0.06	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	36.54	0.00	0.00		No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	19.94	0.04	0.04	RCD	No
E13 Gable (insulation at rafter level)	Non Gov Approved Schemes	2.47	0.00	0.00	RCD	No
E15 Flat roof with parapet	Independently assessed	6.41	0.09	0.09	AbbeyCalculated	No
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	7.12	0.04	0.04	RCD	No

Y-value: 0.04 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500755
Duct Type	Rigid
Wet Rooms	5

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	1
0.15	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0
0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.50	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	3.23	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
PD	106.00	8.00	848.00	12
DL	106.00	8.00	848.00	26

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	16636	
Fuel Type	Mains gas	
In Winter	88.30	
In Summer	87.30	
Model Name	Logic Code Combi	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	Standard Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	
28.0 Water Heating		
Water Heating	Main Heating 1	

Summary for Input Data

SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1
Ensuite 2	Instantaneous electric shower		9.30	No	

28.3 Waste Water Heat Recovery System

Instantaneous System 1

Database ID	80116
Brand Model	Showersave, QB1-21
Details	Year: 2017 + current Efficiency: 69.85 Utilisation factor: 0.973

29.0 Hot Water Cylinder None

32.0 Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
2.01	South	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	Plot 56	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	14 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.99	**TER**	9.21
Environmental	92 A	**% DER < TER**			13.25
CO_2 Emissions (t/year)	0.9	**DFEE**	28.88	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			10.41
% DPER < TPER	10.23	**DPER**	43.09	**TPER**	48.00

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2300	(17)
Infiltration rate		0.1615	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1373	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1750	0.1716	0.1682	0.1510	0.1476	0.1304	0.1304	0.1270	0.1373	0.1476	0.1544	0.1613	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.2051			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200	9.0000	689.5800	(32c)
Internal Floor 1	43.2700	18.0000	778.8600	(32d)
Internal Floor 2	43.2700	18.0000	778.8600	(32d)
Internal Ceiling 1	47.2300	9.0000	425.0700	(32e)
Internal Ceiling 2	43.2700	9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.1913 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	(39)

Average = Sum(39)m / 12 = 113.0196

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	(40)
HLP (average)												0.8449	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---
4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892

Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Total heat required for water heating calculated for each month

	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)

Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)
12Total per year (kWh/year) 2020 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.6460	651.2265	621.8349	600.5850	568.0674	544.1116	521.8038	521.9486	538.9333	560.4304	596.2403	619.0985	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	781.0587	917.2259	1025.3669	1166.9228	1262.9669	1260.6216	1201.5114	1101.6713	998.2034	865.0882	775.5203	743.4971	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	
alpha	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	
util living area	0.9860	0.9721	0.9440	0.8675	0.7286	0.5493	0.4081	0.4614	0.6986	0.9100	0.9740	0.9885	(86)
MIT	19.5597	19.8038	20.1353	20.5420	20.8313	20.9602	20.9910	20.9851	20.8937	20.4997	19.9487	19.4998	(87)
Th 2	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	(88)
util rest of house	0.9834	0.9670	0.9338	0.8444	0.6866	0.4894	0.3377	0.3869	0.6399	0.8889	0.9684	0.9863	(89)
MIT 2	18.5099	18.8188	19.2345	19.7292	20.0572	20.1855	20.2100	20.2064	20.1281	19.6891	19.0051	18.4338	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.7170	19.0131	19.4122	19.8895	20.2099	20.3383	20.3641	20.3600	20.2791	19.8490	19.1913	18.6441	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5670	18.8631	19.2622	19.7395	20.0599	20.1883	20.2141	20.2100	20.1291	19.6990	19.0413	18.4941	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9756	0.9555	0.9184	0.8284	0.6777	0.4873	0.3376	0.3864	0.6331	0.8721	0.9571	0.9796	(94)
Useful gains	762.0344	876.4204	941.6805	966.6718	855.9344	614.3332	405.6796	425.6986	631.9144	754.4192	742.2501	728.3208	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1612.4515	1578.1054	1442.3747	1225.0793	944.8321	631.5882	408.4616	430.6099	681.4121	1028.3694	1349.5990	1615.5135	(97)
Space heating kWh	632.7103	471.5323	372.5165	186.0534	66.1399	0.0000	0.0000	0.0000	0.0000	203.8190	437.2912	660.0713	(98a)
Space heating requirement - total per year (kWh/year)												3030.1339	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	632.7103	471.5323	372.5165	186.0534	66.1399	0.0000	0.0000	0.0000	0.0000	203.8190	437.2912	660.0713	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3030.1339	
Space heating per m2										(98c) / (4) =		22.6518	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	88.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	632.7103	471.5323	372.5165	186.0534	66.1399	0.0000	0.0000	0.0000	0.0000	203.8190	437.2912	660.0713	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	716.5462	534.0117	421.8760	210.7060	74.9036	0.0000	0.0000	0.0000	0.0000	230.8256	495.2335	747.5327	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0548	88.0225	87.9604	87.8268	87.5913	87.3000	87.3000	87.3000	87.3000	87.8466	88.0071	88.0646	(217)
Fuel for water heating, kWh/month	230.7686	203.4578	215.3090	188.1051	181.6298	162.9741	160.3261	167.6338	170.4392	190.2684	203.5252	228.1040	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.5336	-52.1506	-78.1637	-91.7698	-102.3148	-96.8019	-95.6281	-88.5960	-76.6915	-61.3216	-39.7879	-30.4800	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.8034	-31.8472	-64.8942	-99.9561	-134.5464	-136.0704	-134.1667	-112.1769	-80.5539	-46.0585	-19.9190	-11.6434	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3431.6352	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2302.5412	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1735.8756	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4630.0114	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3431.6352	0.2100	720.6434	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.5412	0.2100	483.5337	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1204.1771	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.2395	0.1337	-113.5498	
PV Unit electricity exported	-886.6361	0.1252	-111.0350	
Total			-224.5848	(269)
Total CO2, kg/year			1068.6709	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.9900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3431.6352	1.1300	3877.7478	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.5412	1.1300	2601.8716	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6479.6194	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.2395	1.4941	-1268.8578	
PV Unit electricity exported	-886.6361	0.4597	-407.5466	
Total			-1676.4044	(283)
Total Primary energy kWh/year			5764.3042	(286)
Dwelling Primary energy Rate (DPER)			43.0900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3661	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.0546	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9858	0.9734	0.9491	0.8821	0.7574	0.5808	0.4368	0.4905	0.7261	0.9182	0.9747	0.9881	(86)
MIT	19.3267	19.5811	19.9398	20.4095	20.7577	20.9376	20.9842	20.9754	20.8487	20.3847	19.7818	19.2898	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9831	0.9684	0.9392	0.8596	0.7141	0.5151	0.3565	0.4067	0.6647	0.8975	0.9690	0.9858	(89)
MIT 2	18.1517	18.4755	18.9281	19.5109	19.9128	20.1029	20.1405	20.1368	20.0217	19.4939	18.7399	18.1104	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9573	0.9249	0.8461	0.7109	0.5247	0.3717	0.4222	0.6678	0.8838	0.9584	0.9790	(94)
Useful gains	779.8988	895.5847	964.6773	1000.6973	908.3651	668.6617	451.4744	470.7475	675.9424	777.9455	759.4567	745.8018	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1793.9332	1752.2154	1599.8074	1349.4991	1045.6941	699.3647	457.4319	480.5183	754.1209	1131.8210	1485.3829	1782.4521	(97)
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98a)
Space heating requirement - total per year (kWh/year)												3713.1625	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3713.1625	
Space heating per m2											(98c) / (4) =	27.7578	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	816.4952	623.0042	511.4035	271.7936	110.5766	0.0000	0.0000	0.0000	0.0000	284.9388	565.6568	834.7055	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.5701	86.3118	85.8221	84.7688	82.9827	80.3000	80.3000	80.3000	80.3000	84.8433	86.1226	86.6251	(217)
Fuel for water heating, kWh/month													
	292.5137	259.3615	277.2051	247.3844	245.3111	228.8498	226.3471	235.2227	237.6393	250.2827	261.4890	289.2525	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4018.5742	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3050.8589	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	264.9585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5085.9305	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4018.5742	0.2100	843.9006	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3050.8589	0.2100	640.6804	(264)
Space and water heating			1484.5810	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1232.5839	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4018.5742	1.1300	4540.9888	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3050.8589	1.1300	3447.4706	(278)
Space and water heating			7988.4594	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			6421.2881	(286)
Target Primary Energy Rate (TPER)			48.0000	(287)

Full SAP Calculation Printout

Plot Reference	Plot 56	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	14 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.99	**TER**	9.21
Environmental	92 A	**% DER < TER**			13.25
CO_2 Emissions (t/year)	0.9	**DFEE**	28.88	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			10.41
% DPER < TPER	10.23	**DPER**	43.09	**TPER**	48.00

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2300	(17)
Infiltration rate		0.2776	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2360	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3009	0.2950	0.2891	0.2596	0.2537	0.2242	0.2242	0.2183	0.2360	0.2537	0.2655	0.2773	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5453	0.5435	0.5418	0.5337	0.5322	0.5251	0.5251	0.5238	0.5278	0.5322	0.5352	0.5384	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.2051			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)

Internal Floor 2	43.2700	18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300	9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700	9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.1913 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.9733	61.7735	61.5777	60.6578	60.4858	59.6846	59.6846	59.5363	59.9932	60.4858	60.8339	61.1979	(38)
Heat transfer coeff	118.1646	117.9648	117.7690	116.8492	116.6771	115.8760	115.8760	115.7276	116.1845	116.6771	117.0252	117.3892	(39)
Average = Sum(39)m / 12 =												116.8484	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8833	0.8818	0.8804	0.8735	0.8722	0.8662	0.8662	0.8651	0.8685	0.8722	0.8748	0.8775	(40)
HLP (average)												0.8735	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
								Total per year (kWh/year) = Sum(64)m =			981.4310	(64)
12Total per year (kWh/year)											981	(64)

Electric shower(s)

58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							664.1943	(64a)

Heat gains from water heating, kWh/month

40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Northwest				5.8500	11.2829	0.6300	0.7000	0.7700				20.1720	(81)
Southeast				9.1200	36.7938	0.6300	0.7000	0.7700				102.5514	(77)
Northwest				7.1600	11.2829	0.6300	0.7000	0.7700				24.6892	(81)
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.5184	46.5972	46.6747	47.0421	47.1115	47.4372	47.4372	47.4980	47.3112	47.1115	46.9713	46.8257	
alpha	4.1012	4.1065	4.1116	4.1361	4.1408	4.1625	4.1625	4.1665	4.1541	4.1408	4.1314	4.1217	
util living area	0.9894	0.9780	0.9544	0.8855	0.7546	0.5726	0.4278	0.4840	0.7258	0.9253	0.9797	0.9913	(86)
MIT	19.4029	19.6574	20.0099	20.4642	20.7924	20.9501	20.9882	20.9807	20.8688	20.4224	19.8330	19.3570	(87)
Th 2	20.1817	20.1830	20.1842	20.1901	20.1912	20.1963	20.1963	20.1972	20.1943	20.1912	20.1890	20.1866	(88)
util rest of house	0.9873	0.9739	0.9456	0.8641	0.7129	0.5103	0.3529	0.4051	0.6668	0.9066	0.9752	0.9896	(89)
MIT 2	18.7059	18.9586	19.3057	19.7445	20.0390	20.1677	20.1916	20.1890	20.1103	19.7145	19.1390	18.6640	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.8434	19.0965	19.4446	19.8865	20.1876	20.3220	20.3488	20.3452	20.2599	19.8542	19.2759	18.8007	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8434	19.0965	19.4446	19.8865	20.1876	20.3220	20.3488	20.3452	20.2599	19.8542	19.2759	18.8007	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9828	0.9667	0.9359	0.8550	0.7127	0.5203	0.3674	0.4200	0.6720	0.8973	0.9685	0.9857	(94)
Useful gains	715.5658	836.6260	913.4856	960.4844	871.5072	638.5182	429.9526	448.9153	647.3873	738.6416	705.1679	681.4637	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1718.5123	1674.6864	1524.4739	1283.7647	990.3140	663.0471	434.3915	456.5665	715.6879	1079.7478	1424.8842	1713.9682	(97)
Space heating kWh	746.1922	563.1766	454.5753	232.7618	88.3923	0.0000	0.0000	0.0000	0.0000	253.7830	518.1957	768.1834	(98a)
Space heating requirement - total per year (kWh/year)												3625.2602	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	746.1922	563.1766	454.5753	232.7618	88.3923	0.0000	0.0000	0.0000	0.0000	253.7830	518.1957	768.1834	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3625.2602	
Space heating per m2											(98c) / (4) =	27.1007	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1089.2340	857.4821	879.5298	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8849	0.9319	0.9052	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	963.8623	799.0615	796.1605	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	287.6747	372.9273	289.1671	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	71.9187	93.2318	72.2918	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												237.4423	(107)
Energy for space heating												27.1007	(99)
Energy for space cooling												1.7750	(108)
Total												28.8757	(109)
Fabric Energy Efficiency (DFEE)												28.9	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.0546	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	69.5228	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	

Distribution loss (46)m = 0.15 x (45)m

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
										Total per year (kWh/year) = Sum(64)m =		981.4310	(64)
12Total per year (kWh/year)												981	(64)
Electric shower(s)													
	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		664.1943	(64a)
Heat gains from water heating, kWh/month													
	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains													
	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9896	0.9793	0.9581	0.8963	0.7761	0.5987	0.4518	0.5091	0.7481	0.9319	0.9808	0.9915	(86)
MIT	19.2421	19.5020	19.8713	20.3636	20.7342	20.9305	20.9822	20.9719	20.8308	20.3331	19.7087	19.2054	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9876	0.9752	0.9497	0.8756	0.7340	0.5322	0.3694	0.4232	0.6879	0.9138	0.9763	0.9898	(89)
MIT 2	18.5031	18.7621	19.1270	19.6076	19.9441	20.1086	20.1414	20.1381	20.0362	19.5890	18.9765	18.4729	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6489	18.9081	19.2738	19.7567	20.1000	20.2708	20.3073	20.3026	20.1930	19.7358	19.1209	18.6174	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6489	18.9081	19.2738	19.7567	20.1000	20.2708	20.3073	20.3026	20.1930	19.7358	19.1209	18.6174	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9828	0.9678	0.9395	0.8650	0.7319	0.5422	0.3851	0.4391	0.6916	0.9035	0.9694	0.9857	(94)
Useful gains	715.6229	837.5678	916.9247	971.7452	895.0082	665.3041	450.7186	469.3420	666.3008	743.8142	705.8243	681.4346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1827.7387	1779.4634	1618.3197	1358.0798	1048.2448	699.7643	457.4740	480.5706	755.1334	1140.0729	1507.3889	1817.0266	(97)
Space heating kWh													
	827.4142	632.9538	521.8379	278.1609	114.0080	0.0000	0.0000	0.0000	0.0000	294.8165	577.1265	844.8804	(98a)
Space heating requirement - total per year (kWh/year)												4091.1982	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	827.4142	632.9538	521.8379	278.1609	114.0080	0.0000	0.0000	0.0000	0.0000	294.8165	577.1265	844.8804	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4091.1982	
Space heating per m2											(98c) / (4) =	30.5838	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1159.9452	913.1484	935.8672	0.0000	0.0000	0.0000	0.0000	(100)

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8577	0.9115	0.8809	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	994.8804	832.3652	824.4242	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	265.3417	348.1494	268.1389	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction										fC = cooled area / (4) =		1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	66.3354	87.0373	67.0347	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												220.4075 (107)
Energy for space heating												30.5838 (99)
Energy for space cooling												1.6477 (108)
Total												32.2315 (109)
Fabric Energy Efficiency (TFEE)												32.2 (109)

Full SAP Calculation Printout

Plot Reference	Plot 56	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	14 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.99	**TER**	9.21
Environmental	92 A	**% DER < TER**			13.25
CO_2 Emissions (t/year)	0.9	**DFEE**	28.88	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			10.41
% DPER < TPER	10.23	**DPER**	43.09	**TPER**	48.00

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2300	(17)
Infiltration rate		0.1615	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1373	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1750	0.1716	0.1682	0.1510	0.1476	0.1304	0.1304	0.1270	0.1373	0.1476	0.1544	0.1613	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.2051			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200	9.0000	689.5800	(32c)
Internal Floor 1	43.2700	18.0000	778.8600	(32d)
Internal Floor 2	43.2700	18.0000	778.8600	(32d)
Internal Ceiling 1	47.2300	9.0000	425.0700	(32e)
Internal Ceiling 2	43.2700	9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.1913 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	(39)

Average = Sum(39)m / 12 = 113.0196

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	(40)
HLP (average)												0.8449	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892

Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Total heat required for water heating calculated for each month

	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)

Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)
12Total per year (kWh/year) 2020 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.6460	651.2265	621.8349	600.5850	568.0674	544.1116	521.8038	521.9486	538.9333	560.4304	596.2403	619.0985	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	781.0587	917.2259	1025.3669	1166.9228	1262.9669	1260.6216	1201.5114	1101.6713	998.2034	865.0882	775.5203	743.4971	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	
alpha	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	
util living area	0.9860	0.9721	0.9440	0.8675	0.7286	0.5493	0.4081	0.4614	0.6986	0.9100	0.9740	0.9885	(86)
MIT	19.5597	19.8038	20.1353	20.5420	20.8313	20.9602	20.9910	20.9851	20.8937	20.4997	19.9487	19.4998	(87)
Th 2	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	(88)
util rest of house	0.9834	0.9670	0.9338	0.8444	0.6866	0.4894	0.3377	0.3869	0.6399	0.8889	0.9684	0.9863	(89)
MIT 2	18.5099	18.8188	19.2345	19.7292	20.0572	20.1855	20.2100	20.2064	20.1281	19.6891	19.0051	18.4338	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.7170	19.0131	19.4122	19.8895	20.2099	20.3383	20.3641	20.3600	20.2791	19.8490	19.1913	18.6441	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5670	18.8631	19.2622	19.7395	20.0599	20.1883	20.2141	20.2100	20.1291	19.6990	19.0413	18.4941	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9756	0.9555	0.9184	0.8284	0.6777	0.4873	0.3376	0.3864	0.6331	0.8721	0.9571	0.9796	(94)
Useful gains	762.0344	876.4204	941.6805	966.6718	855.9344	614.3332	405.6796	425.6986	631.9144	754.4192	742.2501	728.3208	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1612.4515	1578.1054	1442.3747	1225.0793	944.8321	631.5882	408.4616	430.6099	681.4121	1028.3694	1349.5990	1615.5135	(97)
Space heating kWh	632.7103	471.5323	372.5165	186.0534	66.1399	0.0000	0.0000	0.0000	0.0000	203.8190	437.2912	660.0713	(98a)
Space heating requirement - total per year (kWh/year)												3030.1339	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	632.7103	471.5323	372.5165	186.0534	66.1399	0.0000	0.0000	0.0000	0.0000	203.8190	437.2912	660.0713	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3030.1339	
Space heating per m2										(98c) / (4) =		22.6518	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	88.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	632.7103	471.5323	372.5165	186.0534	66.1399	0.0000	0.0000	0.0000	0.0000	203.8190	437.2912	660.0713	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	716.5462	534.0117	421.8760	210.7060	74.9036	0.0000	0.0000	0.0000	0.0000	230.8256	495.2335	747.5327	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0548	88.0225	87.9604	87.8268	87.5913	87.3000	87.3000	87.3000	87.3000	87.8466	88.0071	88.0646	(217)
Fuel for water heating, kWh/month	230.7686	203.4578	215.3090	188.1051	181.6298	162.9741	160.3261	167.6338	170.4392	190.2684	203.5252	228.1040	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.5336	-52.1506	-78.1637	-91.7698	-102.3148	-96.8019	-95.6281	-88.5960	-76.6915	-61.3216	-39.7879	-30.4800	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.8034	-31.8472	-64.8942	-99.9561	-134.5464	-136.0704	-134.1667	-112.1769	-80.5539	-46.0585	-19.9190	-11.6434	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3431.6352	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2302.5412	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1735.8756	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4630.0114	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3431.6352	0.2100	720.6434	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.5412	0.2100	483.5337	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1204.1771	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.2395	0.1337	-113.5498	
PV Unit electricity exported	-886.6361	0.1252	-111.0350	
Total			-224.5848	(269)
Total CO2, kg/year			1068.6709	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.9900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3431.6352	1.1300	3877.7478	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.5412	1.1300	2601.8716	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6479.6194	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.2395	1.4941	-1268.8578	
PV Unit electricity exported	-886.6361	0.4597	-407.5466	
Total			-1676.4044	(283)
Total Primary energy kWh/year			5764.3042	(286)
Dwelling Primary energy Rate (DPER)			43.0900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3661	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.0546	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9858	0.9734	0.9491	0.8821	0.7574	0.5808	0.4368	0.4905	0.7261	0.9182	0.9747	0.9881	(86)
MIT	19.3267	19.5811	19.9398	20.4095	20.7577	20.9376	20.9842	20.9754	20.8487	20.3847	19.7818	19.2898	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9831	0.9684	0.9392	0.8596	0.7141	0.5151	0.3565	0.4067	0.6647	0.8975	0.9690	0.9858	(89)
MIT 2	18.1517	18.4755	18.9281	19.5109	19.9128	20.1029	20.1405	20.1368	20.0217	19.4939	18.7399	18.1104	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9573	0.9249	0.8461	0.7109	0.5247	0.3717	0.4222	0.6678	0.8838	0.9584	0.9790	(94)
Useful gains	779.8988	895.5847	964.6773	1000.6973	908.3651	668.6617	451.4744	470.7475	675.9424	777.9455	759.4567	745.8018	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1793.9332	1752.2154	1599.8074	1349.4991	1045.6941	699.3647	457.4319	480.5183	754.1209	1131.8210	1485.3829	1782.4521	(97)
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98a)
Space heating requirement - total per year (kWh/year)												3713.1625	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3713.1625	
Space heating per m2											(98c) / (4) =	27.7578	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	816.4952	623.0042	511.4035	271.7936	110.5766	0.0000	0.0000	0.0000	0.0000	284.9388	565.6568	834.7055	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.5701	86.3118	85.8221	84.7688	82.9827	80.3000	80.3000	80.3000	80.3000	84.8433	86.1226	86.6251	(217)
Fuel for water heating, kWh/month													
	292.5137	259.3615	277.2051	247.3844	245.3111	228.8498	226.3471	235.2227	237.6393	250.2827	261.4890	289.2525	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4018.5742	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3050.8589	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	264.9585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5085.9305	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4018.5742	0.2100	843.9006	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3050.8589	0.2100	640.6804	(264)
Space and water heating			1484.5810	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1232.5839	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4018.5742	1.1300	4540.9888	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3050.8589	1.1300	3447.4706	(278)
Space and water heating			7988.4594	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			6421.2881	(286)
Target Primary Energy Rate (TPER)			48.0000	(287)

Full SAP Calculation Printout

Plot Reference	Plot 56	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	14 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.99	**TER**	9.21
Environmental	92 A	**% DER < TER**			13.25
CO_2 Emissions (t/year)	0.9	**DFEE**	28.88	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			10.41
% DPER < TPER	10.23	**DPER**	43.09	**TPER**	48.00

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2300	(17)
Infiltration rate		0.1615	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1373	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1750	0.1716	0.1682	0.1510	0.1476	0.1304	0.1304	0.1270	0.1373	0.1476	0.1544	0.1613	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.2051			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200		9.0000	689.5800 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.1913 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	(39)
Average = Sum(39)m / 12 =												113.0196	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	(40)
HLP (average)												0.8449	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223 (42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717 (42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714 (42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northwest					5.8500	11.2829		0.6300	0.7000	0.7700		20.1720	(81)
Southeast					9.1200	36.7938		0.6300	0.7000	0.7700		102.5514	(77)
Northwest					7.1600	11.2829		0.6300	0.7000	0.7700		24.6892	(81)
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	853.0643	970.0108	1085.4975	1207.4795	1293.5931	1273.9655	1214.5081	1116.9597	1017.8083	904.2670	824.6296	809.8886	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	
alpha	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	
util living area													
	0.9808	0.9664	0.9335	0.8560	0.7173	0.5443	0.4039	0.4556	0.6893	0.8985	0.9681	0.9844	(86)
MIT	19.6456	19.8628	20.1938	20.5695	20.8413	20.9615	20.9914	20.9858	20.8991	20.5322	20.0040	19.5801	(87)
Th 2	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	(88)
util rest of house													
	0.9773	0.9604	0.9218	0.8317	0.6750	0.4848	0.3342	0.3818	0.6304	0.8755	0.9613	0.9815	(89)
MIT 2	18.6185	18.8926	19.3058	19.7606	20.0671	20.1865	20.2102	20.2068	20.1329	19.7267	19.0742	18.5356	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.8212	19.0840	19.4810	19.9202	20.2199	20.3394	20.3643	20.3605	20.2840	19.8856	19.2576	18.7417	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6712	18.9340	19.3310	19.7702	20.0699	20.1894	20.2143	20.2105	20.1340	19.7356	19.1076	18.5917	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9680	0.9478	0.9058	0.8162	0.6667	0.4828	0.3341	0.3814	0.6239	0.8588	0.9488	0.9732	(94)
Useful gains	825.7656	919.3826	983.2026	985.5188	862.3743	615.0458	405.8129	425.9884	635.0559	776.5639	782.4400	788.2215	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1624.2221	1586.1167	1450.1546	1228.5409	945.9573	631.7101	408.4857	430.6617	681.9628	1032.5048	1357.0954	1626.5410	(97)
Space heating kWh													
	594.0517	448.0453	347.4123	174.9760	62.1858	0.0000	0.0000	0.0000	0.0000	190.4200	413.7519	623.7097	(98a)
Space heating requirement - total per year (kWh/year)												2854.5525	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	594.0517	448.0453	347.4123	174.9760	62.1858	0.0000	0.0000	0.0000	0.0000	190.4200	413.7519	623.7097	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2854.5525	
Space heating per m2											(98c) / (4) =	21.3393	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												88.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	594.0517	448.0453	347.4123	174.9760	62.1858	0.0000	0.0000	0.0000	0.0000	190.4200	413.7519	623.7097	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	672.7652	507.4126	393.4454	198.1608	70.4255	0.0000	0.0000	0.0000	0.0000	215.6512	468.5752	706.3530	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0430	88.0121	87.9446	87.8115	87.5787	87.3000	87.3000	87.3000	87.3000	87.8297	87.9955	88.0543	(217)
Fuel for water heating, kWh/month													
	230.7997	203.4818	215.3478	188.1379	181.6559	162.9741	160.3261	167.6338	170.4392	190.3050	203.5520	228.1308	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.5336	-52.1506	-78.1637	-91.7698	-102.3148	-96.8019	-95.6281	-88.5960	-76.6915	-61.3216	-39.7879	-30.4800	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.8034	-31.8472	-64.8942	-99.9561	-134.5464	-136.0704	-134.1667	-112.1769	-80.5539	-46.0585	-19.9190	-11.6434	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3232.7888	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	87.3000	
Water heating fuel used	2302.7841	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1735.8756	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4431.4078	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3232.7888	3.6400	117.6735	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.7841	3.6400	83.8213	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.2395	16.4900	-140.0396	
PV Unit electricity exported	-886.6361	5.5900	-49.5630	
Total			-189.6026	(252)
Total energy cost			208.0614	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4190	(257)
SAP value		93.2082	
SAP rating (Section 12)		93	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3232.7888	0.2100	678.8857	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.7841	0.2100	483.5847	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1162.4703	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.2395	0.1337	-113.5498	
PV Unit electricity exported	-886.6361	0.1252	-111.0350	
Total			-224.5848	(269)
Total CO2, kg/year			1026.9641	(272)
CO2 emissions per m2			7.6800	(273)
EI value			92.3022	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)			Volume (m3)	
Main dwelling							
Ground floor	47.2300	(1b)	x 2.4000	(2b)	=	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	344.4138	(5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.2300 (17)
Infiltration rate		0.1615 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1373 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1476	0.1407	0.1407	0.1304	0.1338	0.1167	0.1167	0.1133	0.1167	0.1304	0.1270	0.1373	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.2051			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.9862 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 56.1913 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	(39)
Average = Sum(39)m / 12 =												113.0196	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	(40)
HLP (average)												0.8449	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)

Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month													
	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month													
	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains													
	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	880.4573	980.5819	1100.9378	1241.6296	1318.6356	1343.2233	1272.6765	1181.2951	1068.1552	940.3033	854.9654	833.7390	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	
alpha	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	
util living area													
	0.9747	0.9589	0.9166	0.8134	0.6413	0.4301	0.2919	0.3234	0.5977	0.8588	0.9553	0.9790	(86)
MIT	19.7898	19.9830	20.3195	20.6847	20.9100	20.9870	20.9981	20.9971	20.9488	20.6569	20.1589	19.7357	(87)
Th 2	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	(88)
util rest of house													
	0.9699	0.9514	0.9017	0.7829	0.5916	0.3679	0.2230	0.2496	0.5310	0.8275	0.9457	0.9750	(89)
MIT 2	18.8016	19.0443	19.4611	19.8942	20.1376	20.2068	20.2140	20.2136	20.1779	19.8725	19.2686	18.7336	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.9965	19.2295	19.6304	20.0502	20.2900	20.3607	20.3687	20.3682	20.3300	20.0273	19.4442	18.9313	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8465	19.0795	19.4804	19.9002	20.1400	20.2107	20.2187	20.2182	20.1800	19.8773	19.2942	18.7813	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9590	0.9376	0.8851	0.7694	0.5867	0.3676	0.2234	0.2500	0.5279	0.8120	0.9313	0.9651	(94)
Useful gains	844.3289	919.3846	974.4651	955.3151	773.5855	493.7953	284.2745	295.2786	563.8842	763.5470	796.2217	804.6387	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1553.6294	1512.1457	1365.3249	1130.2177	818.2564	498.4981	284.6593	295.9033	585.4422	946.7968	1276.4712	1546.2574	(97)
Space heating kWh													
	527.7196	398.3355	290.7997	125.9299	33.2352	0.0000	0.0000	0.0000	0.0000	136.3379	345.7797	551.7643	(98a)
Space heating requirement - total per year (kWh/year)												2409.9015	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	527.7196	398.3355	290.7997	125.9299	33.2352	0.0000	0.0000	0.0000	0.0000	136.3379	345.7797	551.7643	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2409.9015	
Space heating per m2											(98c) / (4) =	18.0153	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												88.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	527.7196	398.3355	290.7997	125.9299	33.2352	0.0000	0.0000	0.0000	0.0000	136.3379	345.7797	551.7643	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	597.6439	451.1161	329.3315	142.6159	37.6389	0.0000	0.0000	0.0000	0.0000	154.4030	391.5964	624.8746	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0197	87.9874	87.9029	87.7298	87.4712	87.3000	87.3000	87.3000	87.3000	87.7464	87.9562	88.0309	(217)
Fuel for water heating, kWh/month													
	230.8607	203.5389	215.4500	188.3132	181.8792	162.9741	160.3261	167.6338	170.4392	190.4856	203.6429	228.1915	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.0466	-53.8818	-80.1948	-94.8669	-103.9904	-101.3745	-99.6119	-93.7663	-81.7116	-66.4798	-45.1928	-35.4504	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0519	-33.8355	-68.2966	-107.4325	-139.7437	-152.2164	-148.1113	-127.9676	-92.3691	-53.9309	-25.0509	-15.1183	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2729.2203	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2303.7352	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)													
mechanical ventilation fans (SFP = 0.1950)												81.9360	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												167.9360	(231)
Electricity for lighting (calculated in Appendix L)												242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1880.6927	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3783.9734	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2729.2203	7.3200	199.7789	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2303.7352	7.3200	168.6334	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-897.5679	27.6700	-248.3570	
PV Unit electricity exported	-983.1247	5.8100	-57.1195	
Total			-305.4766	(252)
Total energy cost			345.7300	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2729.2203	0.2100	573.1363	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2303.7352	0.2100	483.7844	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1056.9207	(265)

Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-897.5679	0.1339	-120.2105	
PV Unit electricity exported	-983.1247	0.1252	-123.0561	
Total			-243.2666	(269)
Total CO2, kg/year			902.7327	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2729.2203	1.1300	3084.0190	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2303.7352	1.1300	2603.2208	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			5687.2398	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-897.5679	1.4949	-1341.7999	
PV Unit electricity exported	-983.1247	0.4593	-451.5922	
Total			-1793.3920	(283)
Total Primary energy kWh/year			4854.9370	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: A 93
Current environmental impact rating: A 92

N	Solar water heating	SAP increase too small
U	Solar photovoltaic panels	Already installed
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.4	-£ 34	-146 kg (16.2%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 93
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£175	£175	£0
Mains gas	£476	£476	£0
Space heating	£354	£354	£0
Water heating	£230	£230	£0
Lighting	£67	£67	£0
Generated (PV)	-£305	-£305	£0
Total cost of fuels	£346	£346	£0
Total cost of uses	£346	£346	£0
Delivered energy	28 kWh/m²	28 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	36 kWh/m²	36 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.2300 (17)
Infiltration rate		0.1615 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1373 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1750	0.1716	0.1682	0.1510	0.1476	0.1304	0.1304	0.1270	0.1373	0.1476	0.1544	0.1613	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.2051			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		147.9299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.9862 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	56.1913 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	(39)
Average = Sum(39)m / 12 =												113.0196	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	(40)
HLP (average)												0.8449	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.9041 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	853.0643	970.0108	1085.4975	1207.4795	1293.5931	1273.9655	1214.5081	1116.9597	1017.8083	904.2670	824.6296	809.8886	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	
alpha	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	
util living area	0.9808	0.9664	0.9335	0.8560	0.7173	0.5443	0.4039	0.4556	0.6893	0.8985	0.9681	0.9844	(86)
MIT	19.6456	19.8628	20.1938	20.5695	20.8413	20.9615	20.9914	20.9858	20.8991	20.5322	20.0040	19.5801	(87)
Th 2	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	(88)
util rest of house	0.9773	0.9604	0.9218	0.8317	0.6750	0.4848	0.3342	0.3818	0.6304	0.8755	0.9613	0.9815	(89)
MIT 2	18.6185	18.8926	19.3058	19.7606	20.0671	20.1865	20.2102	20.2068	20.1329	19.7267	19.0742	18.5356	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.8212	19.0840	19.4810	19.9202	20.2199	20.3394	20.3643	20.3605	20.2840	19.8856	19.2576	18.7417	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6712	18.9340	19.3310	19.7702	20.0699	20.1894	20.2143	20.2105	20.1340	19.7356	19.1076	18.5917	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9680	0.9478	0.9058	0.8162	0.6667	0.4828	0.3341	0.3814	0.6239	0.8588	0.9488	0.9732	(94)
Useful gains	825.7656	919.3826	983.2026	985.5188	862.3743	615.0458	405.8129	425.9884	635.0559	776.5639	782.4400	788.2215	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1624.2221	1586.1167	1450.1546	1228.5409	945.9573	631.7101	408.4857	430.6617	681.9628	1032.5048	1357.0954	1626.5410	(97)
Space heating kWh	594.0517	448.0453	347.4123	174.9760	62.1858	0.0000	0.0000	0.0000	0.0000	190.4200	413.7519	623.7097	(98a)
Space heating requirement - total per year (kWh/year)												2854.5525	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	

Space heating kWh
594.0517 448.0453 347.4123 174.9760 62.1858 0.0000 0.0000 0.0000 0.0000 190.4200 413.7519 623.7097 (98c)
Space heating requirement after solar contribution - total per year (kWh/year) 2854.5525
Space heating per m2 (98c) / (4) = 21.3393 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 88.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	594.0517	448.0453	347.4123	174.9760	62.1858	0.0000	0.0000	0.0000	0.0000	190.4200	413.7519	623.7097	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	672.7652	507.4126	393.4454	198.1608	70.4255	0.0000	0.0000	0.0000	0.0000	215.6512	468.5752	706.3530	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0430	88.0121	87.9446	87.8115	87.5787	87.3000	87.3000	87.3000	87.3000	87.8297	87.9955	88.0543	(217)
Fuel for water heating, kWh/month													
	230.7997	203.4818	215.3478	188.1379	181.6559	162.9741	160.3261	167.6338	170.4392	190.3050	203.5520	228.1308	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.5336	-52.1506	-78.1637	-91.7698	-102.3148	-96.8019	-95.6281	-88.5960	-76.6915	-61.3216	-39.7879	-30.4800	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.8034	-31.8472	-64.8942	-99.9561	-134.5464	-136.0704	-134.1667	-112.1769	-80.5539	-46.0585	-19.9190	-11.6434	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 3232.7888 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 87.3000
Water heating fuel used 2302.7841 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)
mechanical ventilation fans (SFP = 0.1950) 81.9360 (230a)
central heating pump 41.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 167.9360 (231)
Electricity for lighting (calculated in Appendix L) 242.3764 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -1735.8756 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 4431.4078 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3232.7888	3.6400	117.6735	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.7841	3.6400	83.8213	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.2395	16.4900	-140.0396	
PV Unit electricity exported	-886.6361	5.5900	-49.5630	
Total			-189.6026	(252)
Total energy cost			208.0614	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.4190 (257)

SAP value	93.2082	
SAP rating (Section 12)	93	(258)
SAP band	A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3232.7888	0.2100	678.8857	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.7841	0.2100	483.5847	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1162.4703	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-849.2395	0.1337	-113.5498	
PV Unit electricity exported	-886.6361	0.1252	-111.0350	
Total			-224.5848	(269)
Total CO2, kg/year			1026.9641	(272)
CO2 emissions per m2			7.6800	(273)
EI value			92.3022	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.2300 (17)
Infiltration rate		0.1615 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1373 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1476	0.1407	0.1407	0.1304	0.1338	0.1167	0.1167	0.1133	0.1167	0.1304	0.1270	0.1373	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	50.2051		(33)
Main dwelling						
Party Wall 1	150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1	70.0800			9.0000	630.7200	(32c)
Internal Wall 2	86.3900			9.0000	777.5100	(32c)
Internal Wall 3	76.6200			9.0000	689.5800	(32c)
Internal Floor 1	43.2700			18.0000	778.8600	(32d)
Internal Floor 2	43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1	47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2	43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19788.5781	(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		147.9299	(35)	
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965	
E3 Sill	8.3000	0.0170	0.1411	
E4 Jamb	45.3100	0.0130	0.5890	
E5 Ground floor (normal)	9.4700	0.0660	0.6250	
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568	
E18 Party wall between dwellings	30.9600	0.0400	1.2384	
P1 Party wall - Ground floor	19.9400	0.0580	1.1565	
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178	
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096	
E15 Flat roof with parapet	6.4100	0.0890	0.5705	
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.9862	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =		56.1913	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	113.0196	(39)
Average = Sum(39)m / 12 =												113.0196	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	0.8449	(40)
HLP (average)												0.8449	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9041	(42)
Hot water usage for mixer showers													
	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths													
	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses													
	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)
Average daily hot water use (litres/day)												114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month													
	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month													
	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains													
	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	880.4573	980.5819	1100.9378	1241.6296	1318.6356	1343.2233	1272.6765	1181.2951	1068.1552	940.3033	854.9654	833.7390	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	48.6360	
alpha	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	4.2424	
util living area	0.9747	0.9589	0.9166	0.8134	0.6413	0.4301	0.2919	0.3234	0.5977	0.8588	0.9553	0.9790	(86)
MIT	19.7898	19.9830	20.3195	20.6847	20.9100	20.9870	20.9981	20.9971	20.9488	20.6569	20.1589	19.7357	(87)
Th 2	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	20.2146	(88)
util rest of house	0.9699	0.9514	0.9017	0.7829	0.5916	0.3679	0.2230	0.2496	0.5310	0.8275	0.9457	0.9750	(89)
MIT 2	18.8016	19.0443	19.4611	19.8942	20.1376	20.2068	20.2140	20.2136	20.1779	19.8725	19.2686	18.7336	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.9965	19.2295	19.6304	20.0502	20.2900	20.3607	20.3687	20.3682	20.3300	20.0273	19.4442	18.9313	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8465	19.0795	19.4804	19.9002	20.1400	20.2107	20.2187	20.2182	20.1800	19.8773	19.2942	18.7813	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9590	0.9376	0.8851	0.7694	0.5867	0.3676	0.2234	0.2500	0.5279	0.8120	0.9313	0.9651	(94)
Useful gains	844.3289	919.3846	974.4651	955.3151	773.5855	493.7953	284.2745	295.2786	563.8842	763.5470	796.2217	804.6387	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1553.6294	1512.1457	1365.3249	1130.2177	818.2564	498.4981	284.6593	295.9033	585.4422	946.7968	1276.4712	1546.2574	(97)
Space heating kWh	527.7196	398.3355	290.7997	125.9299	33.2352	0.0000	0.0000	0.0000	0.0000	136.3379	345.7797	551.7643	(98a)
Space heating requirement - total per year (kWh/year)												2409.9015	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	527.7196	398.3355	290.7997	125.9299	33.2352	0.0000	0.0000	0.0000	0.0000	136.3379	345.7797	551.7643	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2409.9015	
Space heating per m2											(98c) / (4) =	18.0153	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	527.7196	398.3355	290.7997	125.9299	33.2352	0.0000	0.0000	0.0000	0.0000	136.3379	345.7797	551.7643	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	597.6439	451.1161	329.3315	142.6159	37.6389	0.0000	0.0000	0.0000	0.0000	154.4030	391.5964	624.8746	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0197	87.9874	87.9029	87.7298	87.4712	87.3000	87.3000	87.3000	87.3000	87.7464	87.9562	88.0309	(217)
Fuel for water heating, kWh/month	230.8607	203.5389	215.4500	188.3132	181.8792	162.9741	160.3261	167.6338	170.4392	190.4856	203.6429	228.1915	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.0466	-53.8818	-80.1948	-94.8669	-103.9904	-101.3745	-99.6119	-93.7663	-81.7116	-66.4798	-45.1928	-35.4504	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0519	-33.8355	-68.2966	-107.4325	-139.7437	-152.2164	-148.1113	-127.9676	-92.3691	-53.9309	-25.0509	-15.1183	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2729.2203	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2303.7352	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1880.6927	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3783.9734	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2729.2203	7.3200	199.7789	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2303.7352	7.3200	168.6334	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-897.5679	27.6700	-248.3570	
PV Unit electricity exported	-983.1247	5.8100	-57.1195	
Total			-305.4766	(252)
Total energy cost			345.7300	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2729.2203	0.2100	573.1363	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2303.7352	0.2100	483.7844	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1056.9207	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-897.5679	0.1339	-120.2105	
PV Unit electricity exported	-983.1247	0.1252	-123.0561	
Total			-243.2666	(269)
Total CO2, kg/year			902.7327	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2729.2203	1.1300	3084.0190	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2303.7352	1.1300	2603.2208	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			5687.2398	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-897.5679	1.4949	-1341.7999	
PV Unit electricity exported	-983.1247	0.4593	-451.5922	
Total			-1793.3920	(283)
Total Primary energy kWh/year			4854.9370	(286)

Summary for Input Data

Plot Reference	Plot 57	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	16 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	95 A	**DER**	7.21	**TER**	9.21
Environmental	93 A	**% DER < TER**			21.72
CO_2 Emissions (t/year)	0.79	**DFEE**	28.75	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			10.81
% DPER < TPER	19.40	**DPER**	38.69	**TPER**	48.00

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, Mid-Terrace	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	147.93	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	9.47 m	47.23 m²	2.40 m
1st Storey:	9.47 m	43.27 m²	2.67 m
2nd Storey:	9.47 m	43.27 m²	2.67 m

8.0 Living Area	26.39	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.25	60.00	73.30	49.03	0.00	None	24.27	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	150.34	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	70.08
Internal Wall 2	Plasterboard on timber frame	9.00	86.39
Internal Wall 3	Plasterboard on timber frame	9.00	76.62

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof-500mm	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	32.20	32.20	None	0.00	Enter Gross Area	0.00
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.91	3.91	None	0.00	Enter Gross Area	0.00
Sloping	External Slope Roof	Plasterboard, insulated slope	0.14	9.00	10.21	10.21	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.23
Internal Ceiling 2	+2	Plasterboard ceiling, carpeted chipboard floor	9.00	43.27

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground FLoor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.12	None	0.00	110.00	47.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27
Internal Floor 2	+2	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Front Door	Brickwork	South East	2.15	
Patio Door	Patio Door	Brickwork	North West	5.85	
NW	Window	Brickwork	North West	7.16	
SE	Window	Brickwork	South East	9.12	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging — Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	11.93	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.30	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	45.31	0.01	0.01	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	9.47	0.07	0.07	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	18.95	0.00	0.00	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	30.96	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	19.94	0.06	0.06	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	36.54	0.00	0.00		No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	19.94	0.04	0.04	RCD	No
E13 Gable (insulation at rafter level)	Non Gov Approved Schemes	2.47	0.00	0.00	RCD	No
E15 Flat roof with parapet	Independently assessed	6.41	0.09	0.09	AbbeyCalculated	No
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	7.12	0.04	0.04	RCD	No

Y-value: 0.04 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500755
Duct Type	Rigid
Wet Rooms	5

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	1
0.15	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0
0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.50	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.71	$m^3/(h.m^2)$ @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
PD	106.00	8.00	848.00	12
DL	106.00	8.00	848.00	26

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18123	
Fuel Type	Mains gas	
In Winter	89.00	
In Summer	87.30	
Model Name	LOGIC CODE COMBI ESP1	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	Standard Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	
28.0 Water Heating		
Water Heating	Main Heating 1	

Summary for Input Data

SAP Code	901
Flue Gas Heat Recovery System	Yes
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1
Ensuite 2	Instantaneous electric shower		9.30	No	

28.2 Flue Gas Heat Recovery System

Database ID	0
Brand Model	
Details	

28.3 Waste Water Heat Recovery System
Instantaneous System 1

Database ID	80116
Brand Model	Showersave, QB1-21
Details	Year: 2017 + current Efficiency: 69.85 Utilisation factor: 0.973

29.0 Hot Water Cylinder None

32.0 Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
2.43	South	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations
Lower cost measures
None
Further measures to achieve even higher standards
None

Full SAP Calculation Printout

Plot Reference	Plot 57	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	16 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	95 A	**DER**	7.21	**TER**	9.21
Environmental	93 A	**% DER < TER**			21.72
CO_2 Emissions (t/year)	0.79	**DFEE**	28.75	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			10.81
% DPER < TPER	19.40	**DPER**	38.69	**TPER**	48.00

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7100	(17)
Infiltration rate		0.1355	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1152	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1468	0.1440	0.1411	0.1267	0.1238	0.1094	0.1094	0.1065	0.1152	0.1238	0.1296	0.1353	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.6774			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200		9.0000	689.5800 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.6636 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	(39)
Average = Sum(39)m / 12 =												113.4919	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	(40)
HLP (average)												0.8484	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
12Total per year (kWh/year)												1764	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	626.2393	643.8310	614.4600	593.2546	560.7645	536.8373	514.5467	514.6767	531.6441	553.1095	588.8766	611.6974	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	773.6520	909.8304	1017.9920	1159.5924	1255.6640	1253.3473	1194.2543	1094.3994	990.9142	857.7673	768.1567	736.0960	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	
alpha	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	
util living area	0.9865	0.9730	0.9455	0.8704	0.7328	0.5538	0.4120	0.4659	0.7037	0.9127	0.9750	0.9890	(86)
MIT	19.5422	19.7870	20.1204	20.5313	20.8258	20.9585	20.9905	20.9843	20.8896	20.4882	19.9330	19.4822	(87)
Th 2	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	(88)
util rest of house	0.9840	0.9680	0.9355	0.8475	0.6909	0.4934	0.3408	0.3905	0.6450	0.8919	0.9695	0.9869	(89)
MIT 2	18.4855	18.7955	19.2139	19.7142	20.0488	20.1811	20.2067	20.2030	20.1216	19.6733	18.9833	18.4092	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6940	18.9911	19.3927	19.8754	20.2021	20.3345	20.3614	20.3571	20.2731	19.8341	19.1707	18.6209	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5440	18.8411	19.2427	19.7254	20.0521	20.1845	20.2114	20.2071	20.1231	19.6841	19.0207	18.4709	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9764	0.9567	0.9202	0.8314	0.6817	0.4913	0.3407	0.3901	0.6379	0.8751	0.9584	0.9802	(94)
Useful gains	755.3885	870.3988	936.7500	964.0578	856.0312	615.7578	406.9247	426.9007	632.0810	750.5984	736.1873	721.5579	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1616.5738	1582.2036	1446.1941	1228.5940	947.8941	633.7937	409.8592	432.0766	683.5700	1030.9670	1352.8998	1619.6310	(97)
Space heating kWh	640.7219	478.3328	379.0264	190.4661	68.3460	0.0000	0.0000	0.0000	0.0000	208.5942	444.0330	668.1664	(98a)
Space heating requirement - total per year (kWh/year)												3077.6868	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	640.7219	478.3328	379.0264	190.4661	68.3460	0.0000	0.0000	0.0000	0.0000	208.5942	444.0330	668.1664	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3077.6868	
Space heating per m2											(98c) / (4) =	23.0073	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	640.7219	478.3328	379.0264	190.4661	68.3460	0.0000	0.0000	0.0000	0.0000	208.5942	444.0330	668.1664	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	719.9123	537.4526	425.8724	214.0068	76.7932	0.0000	0.0000	0.0000	0.0000	234.3755	498.9135	750.7487	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.6196	88.5693	88.4721	88.2598	87.8576	87.3000	87.3000	87.3000	87.3000	88.2939	88.5477	88.6355	(217)
Fuel for water heating, kWh/month	204.4249	179.7567	189.2563	163.2627	156.3421	138.9763	135.5870	142.8443	146.3923	164.6288	178.3325	201.7852	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.4618	-60.0609	-88.8559	-102.9269	-113.5609	-107.0227	-105.7369	-98.5479	-86.1799	-70.0244	-46.1543	-35.6548	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.3933	-41.4888	-84.0948	-128.8611	-172.7937	-174.5094	-172.0747	-144.1775	-103.9228	-59.7933	-26.0286	-15.2705	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3458.0750	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2001.5892	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2098.5959	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3992.7789	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3458.0750	0.2100	726.1958	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2001.5892	0.2100	420.3337	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1146.5295	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	0.1340	-128.1068	
PV Unit electricity exported	-1142.4085	0.1254	-143.2342	
Total			-271.3409	(269)
Total CO2, kg/year			964.2672	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3458.0750	1.1300	3907.6248	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2001.5892	1.1300	2261.7958	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6169.4206	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	1.4951	-1429.6152	
PV Unit electricity exported	-1142.4085	0.4602	-525.7398	
Total			-1955.3550	(283)
Total Primary energy kWh/year			5175.1549	(286)
Dwelling Primary energy Rate (DPER)			38.6900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3661	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.0546	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9858	0.9734	0.9491	0.8821	0.7574	0.5808	0.4368	0.4905	0.7261	0.9182	0.9747	0.9881	(86)
MIT	19.3267	19.5811	19.9398	20.4095	20.7577	20.9376	20.9842	20.9754	20.8487	20.3847	19.7818	19.2898	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9831	0.9684	0.9392	0.8596	0.7141	0.5151	0.3565	0.4067	0.6647	0.8975	0.9690	0.9858	(89)
MIT 2	18.1517	18.4755	18.9281	19.5109	19.9128	20.1029	20.1405	20.1368	20.0217	19.4939	18.7399	18.1104	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9573	0.9249	0.8461	0.7109	0.5247	0.3717	0.4222	0.6678	0.8838	0.9584	0.9790	(94)
Useful gains	779.8988	895.5847	964.6773	1000.6973	908.3651	668.6617	451.4744	470.7475	675.9424	777.9455	759.4567	745.8018	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1793.9332	1752.2154	1599.8074	1349.4991	1045.6941	699.3647	457.4319	480.5183	754.1209	1131.8210	1485.3829	1782.4521	(97)
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98a)
Space heating requirement - total per year (kWh/year)												3713.1625	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3713.1625	
Space heating per m2											(98c) / (4) =	27.7578	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	816.4952	623.0042	511.4035	271.7936	110.5766	0.0000	0.0000	0.0000	0.0000	284.9388	565.6568	834.7055	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.5701	86.3118	85.8221	84.7688	82.9827	80.3000	80.3000	80.3000	80.3000	84.8433	86.1226	86.6251	(217)
Fuel for water heating, kWh/month													
	292.5137	259.3615	277.2051	247.3844	245.3111	228.8498	226.3471	235.2227	237.6393	250.2827	261.4890	289.2525	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4018.5742	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3050.8589	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	264.9585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5085.9305	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4018.5742	0.2100	843.9006	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3050.8589	0.2100	640.6804	(264)
Space and water heating			1484.5810	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1232.5839	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4018.5742	1.1300	4540.9888	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3050.8589	1.1300	3447.4706	(278)
Space and water heating			7988.4594	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			6421.2881	(286)
Target Primary Energy Rate (TPER)			48.0000	(287)

Full SAP Calculation Printout

Plot Reference	Plot 57	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	16 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	95 A	**DER**	7.21	**TER**	9.21
Environmental	93 A	**% DER < TER**			21.72
CO_2 Emissions (t/year)	0.79	**DFEE**	28.75	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			10.81
% DPER < TPER	19.40	**DPER**	38.69	**TPER**	48.00

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7100	(17)
Infiltration rate		0.2516	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2139	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2727	0.2674	0.2620	0.2353	0.2299	0.2032	0.2032	0.1979	0.2139	0.2299	0.2406	0.2513	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5372	0.5357	0.5343	0.5277	0.5264	0.5206	0.5206	0.5196	0.5229	0.5264	0.5290	0.5316	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.6774			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)

Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.6636 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.0548	60.8906	60.7298	59.9742	59.8328	59.1747	59.1747	59.0528	59.4282	59.8328	60.1188	60.4178	(38)
Heat transfer coeff	117.7184	117.5543	117.3934	116.6378	116.4964	115.8383	115.8383	115.7165	116.0918	116.4964	116.7824	117.0814	(39)
Average = Sum(39)m / 12 =												116.6371	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8800	0.8788	0.8776	0.8719	0.8709	0.8660	0.8660	0.8650	0.8678	0.8709	0.8730	0.8752	(40)
HLP (average)												0.8719	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
								Total per year (kWh/year) = Sum(64)m =			981.4310	(64)
12Total per year (kWh/year)											981	(64)

Electric shower(s)

58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											664.1943	(64a)

Heat gains from water heating, kWh/month

40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Northwest				5.8500	11.2829	0.6300	0.7000	0.7700				20.1720	(81)
Southeast				9.1200	36.7938	0.6300	0.7000	0.7700				102.5514	(77)
Northwest				7.1600	11.2829	0.6300	0.7000	0.7700				24.6892	(81)
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.6947	46.7599	46.8240	47.1273	47.1845	47.4526	47.4526	47.5026	47.3490	47.1845	47.0690	46.9488	
alpha	4.1130	4.1173	4.1216	4.1418	4.1456	4.1635	4.1635	4.1668	4.1566	4.1456	4.1379	4.1299	
util living area	0.9893	0.9780	0.9543	0.8852	0.7541	0.5725	0.4277	0.4839	0.7255	0.9252	0.9797	0.9913	(86)
MIT	19.4108	19.6645	20.0158	20.4668	20.7936	20.9502	20.9883	20.9807	20.8693	20.4244	19.8366	19.3625	(87)
Th 2	20.1845	20.1856	20.1866	20.1914	20.1923	20.1965	20.1965	20.1973	20.1949	20.1923	20.1905	20.1886	(88)
util rest of house	0.9873	0.9738	0.9454	0.8638	0.7124	0.5101	0.3528	0.4051	0.6666	0.9064	0.9751	0.9896	(89)
MIT 2	18.7159	18.9677	19.3133	19.7481	20.0411	20.1680	20.1919	20.1891	20.1112	19.7173	19.1438	18.6710	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.8530	19.1052	19.4519	19.8898	20.1896	20.3223	20.3490	20.3452	20.2607	19.8568	19.2804	18.8074	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8530	19.1052	19.4519	19.8898	20.1896	20.3223	20.3490	20.3452	20.2607	19.8568	19.2804	18.8074	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9667	0.9358	0.8547	0.7122	0.5202	0.3673	0.4200	0.6717	0.8971	0.9684	0.9857	(94)
Useful gains	715.5593	836.5724	913.3140	960.1561	870.9319	638.3773	429.8455	448.8835	647.1415	738.5094	705.1442	681.4629	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1713.1539	1669.8795	1520.4687	1281.8313	989.0042	662.8610	434.2744	456.5299	715.2083	1078.3855	1422.4615	1710.2532	(97)
Space heating kWh	742.2104	559.9824	451.7231	231.6061	87.8458	0.0000	0.0000	0.0000	0.0000	252.8679	516.4685	765.4200	(98a)
Space heating requirement - total per year (kWh/year)												3608.1242	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	742.2104	559.9824	451.7231	231.6061	87.8458	0.0000	0.0000	0.0000	0.0000	252.8679	516.4685	765.4200	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3608.1242	
Space heating per m2											(98c) / (4) =	26.9726	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1088.8803	857.2037	879.4451	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8850	0.9320	0.9052	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	963.6952	798.8854	796.1152	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	287.7950	373.0584	289.2009	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	71.9488	93.2646	72.3002	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												237.5136	(107)
Energy for space heating												26.9726	(99)
Energy for space cooling												1.7755	(108)
Total												28.7481	(109)
Fabric Energy Efficiency (DFEE)												28.7	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.0546	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	69.5228	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	

Distribution loss (46)m = 0.15 x (45)m

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
										Total per year (kWh/year) = Sum(64)m =		981.4310	(64)
12Total per year (kWh/year)												981	(64)
Electric shower(s)													
	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		664.1943	(64a)
Heat gains from water heating, kWh/month													
	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains													
	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9896	0.9793	0.9581	0.8963	0.7761	0.5987	0.4518	0.5091	0.7481	0.9319	0.9808	0.9915	(86)
MIT	19.2421	19.5020	19.8713	20.3636	20.7342	20.9305	20.9822	20.9719	20.8308	20.3331	19.7087	19.2054	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9876	0.9752	0.9497	0.8756	0.7340	0.5322	0.3694	0.4232	0.6879	0.9138	0.9763	0.9898	(89)
MIT 2	18.5031	18.7621	19.1270	19.6076	19.9441	20.1086	20.1414	20.1381	20.0362	19.5890	18.9765	18.4729	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6489	18.9081	19.2738	19.7567	20.1000	20.2708	20.3073	20.3026	20.1930	19.7358	19.1209	18.6174	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6489	18.9081	19.2738	19.7567	20.1000	20.2708	20.3073	20.3026	20.1930	19.7358	19.1209	18.6174	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9828	0.9678	0.9395	0.8650	0.7319	0.5422	0.3851	0.4391	0.6916	0.9035	0.9694	0.9857	(94)
Useful gains	715.6229	837.5678	916.9247	971.7452	895.0082	665.3041	450.7186	469.3420	666.3008	743.8142	705.8243	681.4346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1827.7387	1779.4634	1618.3197	1358.0798	1048.2448	699.7643	457.4740	480.5706	755.1334	1140.0729	1507.3889	1817.0266	(97)
Space heating kWh													
	827.4142	632.9538	521.8379	278.1609	114.0080	0.0000	0.0000	0.0000	0.0000	294.8165	577.1265	844.8804	(98a)
Space heating requirement - total per year (kWh/year)												4091.1982	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	827.4142	632.9538	521.8379	278.1609	114.0080	0.0000	0.0000	0.0000	0.0000	294.8165	577.1265	844.8804	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4091.1982	
Space heating per m2											(98c) / (4) =	30.5838	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1159.9452	913.1484	935.8672	0.0000	0.0000	0.0000	0.0000	(100)

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8577	0.9115	0.8809	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	994.8804	832.3652	824.4242	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	265.3417	348.1494	268.1389	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction										fC = cooled area / (4) =		1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	66.3354	87.0373	67.0347	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												220.4075 (107)
Energy for space heating												30.5838 (99)
Energy for space cooling												1.6477 (108)
Total												32.2315 (109)
Fabric Energy Efficiency (TFEE)												32.2 (109)

Full SAP Calculation Printout

Plot Reference	Plot 57	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	16 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	95 A	**DER**	7.21	**TER**	9.21
Environmental	93 A	**% DER < TER**			21.72
CO_2 Emissions (t/year)	0.79	**DFEE**	28.75	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			10.81
% DPER < TPER	19.40	**DPER**	38.69	**TPER**	48.00

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7100	(17)
Infiltration rate		0.1355	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1152	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1468	0.1440	0.1411	0.1267	0.1238	0.1094	0.1094	0.1065	0.1152	0.1238	0.1296	0.1353	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.6774			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200		9.0000	689.5800 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.6636 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	(39)
Average = Sum(39)m / 12 =												113.4919	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	(40)
HLP (average)												0.8484	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
12Total per year (kWh/year)												1764	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	626.2393	643.8310	614.4600	593.2546	560.7645	536.8373	514.5467	514.6767	531.6441	553.1095	588.8766	611.6974	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	773.6520	909.8304	1017.9920	1159.5924	1255.6640	1253.3473	1194.2543	1094.3994	990.9142	857.7673	768.1567	736.0960	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	
alpha	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	
util living area	0.9865	0.9730	0.9455	0.8704	0.7328	0.5538	0.4120	0.4659	0.7037	0.9127	0.9750	0.9890	(86)
MIT	19.5422	19.7870	20.1204	20.5313	20.8258	20.9585	20.9905	20.9843	20.8896	20.4882	19.9330	19.4822	(87)
Th 2	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	(88)
util rest of house	0.9840	0.9680	0.9355	0.8475	0.6909	0.4934	0.3408	0.3905	0.6450	0.8919	0.9695	0.9869	(89)
MIT 2	18.4855	18.7955	19.2139	19.7142	20.0488	20.1811	20.2067	20.2030	20.1216	19.6733	18.9833	18.4092	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6940	18.9911	19.3927	19.8754	20.2021	20.3345	20.3614	20.3571	20.2731	19.8341	19.1707	18.6209	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5440	18.8411	19.2427	19.7254	20.0521	20.1845	20.2114	20.2071	20.1231	19.6841	19.0207	18.4709	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9764	0.9567	0.9202	0.8314	0.6817	0.4913	0.3407	0.3901	0.6379	0.8751	0.9584	0.9802	(94)
Useful gains	755.3885	870.3988	936.7500	964.0578	856.0312	615.7578	406.9247	426.9007	632.0810	750.5984	736.1873	721.5579	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1616.5738	1582.2036	1446.1941	1228.5940	947.8941	633.7937	409.8592	432.0766	683.5700	1030.9670	1352.8998	1619.6310	(97)
Space heating kWh	640.7219	478.3328	379.0264	190.4661	68.3460	0.0000	0.0000	0.0000	0.0000	208.5942	444.0330	668.1664	(98a)
Space heating requirement - total per year (kWh/year)												3077.6868	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	640.7219	478.3328	379.0264	190.4661	68.3460	0.0000	0.0000	0.0000	0.0000	208.5942	444.0330	668.1664	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3077.6868	
Space heating per m2											(98c) / (4) =	23.0073	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	640.7219	478.3328	379.0264	190.4661	68.3460	0.0000	0.0000	0.0000	0.0000	208.5942	444.0330	668.1664	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	719.9123	537.4526	425.8724	214.0068	76.7932	0.0000	0.0000	0.0000	0.0000	234.3755	498.9135	750.7487	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.6196	88.5693	88.4721	88.2598	87.8576	87.3000	87.3000	87.3000	87.3000	88.2939	88.5477	88.6355	(217)
Fuel for water heating, kWh/month	204.4249	179.7567	189.2563	163.2627	156.3421	138.9763	135.5870	142.8443	146.3923	164.6288	178.3325	201.7852	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.4618	-60.0609	-88.8559	-102.9269	-113.5609	-107.0227	-105.7369	-98.5479	-86.1799	-70.0244	-46.1543	-35.6548	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.3933	-41.4888	-84.0948	-128.8611	-172.7937	-174.5094	-172.0747	-144.1775	-103.9228	-59.7933	-26.0286	-15.2705	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3458.0750	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2001.5892	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2098.5959	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3992.7789	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3458.0750	0.2100	726.1958	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2001.5892	0.2100	420.3337	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1146.5295	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	0.1340	-128.1068	
PV Unit electricity exported	-1142.4085	0.1254	-143.2342	
Total			-271.3409	(269)
Total CO2, kg/year			964.2672	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3458.0750	1.1300	3907.6248	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2001.5892	1.1300	2261.7958	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6169.4206	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	1.4951	-1429.6152	
PV Unit electricity exported	-1142.4085	0.4602	-525.7398	
Total			-1955.3550	(283)
Total Primary energy kWh/year			5175.1549	(286)
Dwelling Primary energy Rate (DPER)			38.6900	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3661	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.0546	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9858	0.9734	0.9491	0.8821	0.7574	0.5808	0.4368	0.4905	0.7261	0.9182	0.9747	0.9881	(86)
MIT	19.3267	19.5811	19.9398	20.4095	20.7577	20.9376	20.9842	20.9754	20.8487	20.3847	19.7818	19.2898	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9831	0.9684	0.9392	0.8596	0.7141	0.5151	0.3565	0.4067	0.6647	0.8975	0.9690	0.9858	(89)
MIT 2	18.1517	18.4755	18.9281	19.5109	19.9128	20.1029	20.1405	20.1368	20.0217	19.4939	18.7399	18.1104	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9573	0.9249	0.8461	0.7109	0.5247	0.3717	0.4222	0.6678	0.8838	0.9584	0.9790	(94)
Useful gains	779.8988	895.5847	964.6773	1000.6973	908.3651	668.6617	451.4744	470.7475	675.9424	777.9455	759.4567	745.8018	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1793.9332	1752.2154	1599.8074	1349.4991	1045.6941	699.3647	457.4319	480.5183	754.1209	1131.8210	1485.3829	1782.4521	(97)
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98a)
Space heating requirement - total per year (kWh/year)												3713.1625	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3713.1625	
Space heating per m2											(98c) / (4) =	27.7578	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	816.4952	623.0042	511.4035	271.7936	110.5766	0.0000	0.0000	0.0000	0.0000	284.9388	565.6568	834.7055	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.5701	86.3118	85.8221	84.7688	82.9827	80.3000	80.3000	80.3000	80.3000	84.8433	86.1226	86.6251	(217)
Fuel for water heating, kWh/month													
	292.5137	259.3615	277.2051	247.3844	245.3111	228.8498	226.3471	235.2227	237.6393	250.2827	261.4890	289.2525	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4018.5742	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3050.8589	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	264.9585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5085.9305	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4018.5742	0.2100	843.9006	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3050.8589	0.2100	640.6804	(264)
Space and water heating			1484.5810	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1232.5839	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4018.5742	1.1300	4540.9888	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3050.8589	1.1300	3447.4706	(278)
Space and water heating			7988.4594	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			6421.2881	(286)
Target Primary Energy Rate (TPER)			48.0000	(287)

Full SAP Calculation Printout

Plot Reference	Plot 57	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	16 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	95 A	**DER**	7.21	**TER**	9.21
Environmental	93 A	**% DER < TER**			21.72
CO_2 Emissions (t/year)	0.79	**DFEE**	28.75	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			10.81
% DPER < TPER	19.40	**DPER**	38.69	**TPER**	48.00

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7100	(17)
Infiltration rate		0.1355	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1152	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1468	0.1440	0.1411	0.1267	0.1238	0.1094	0.1094	0.1065	0.1152	0.1238	0.1296	0.1353	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.6774			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200		9.0000	689.5800 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.6636 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	(39)

Average = Sum(39)m / 12 = 113.4919

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	(40)
HLP (average)												0.8484	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892
Distribution loss (46)m = 0.15 x (45)m

29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)

Total heat required for water heating calculated for each month

202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS -21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)

Total per year (kWh/year) = Sum(64)m = 1763.5798 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northwest					5.8500	11.2829		0.6300	0.7000	0.7700		20.1720	(81)
Southeast					9.1200	36.7938		0.6300	0.7000	0.7700		102.5514	(77)
Northwest					7.1600	11.2829		0.6300	0.7000	0.7700		24.6892	(81)
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	845.6576	962.6152	1078.1226	1200.1491	1286.2902	1266.6912	1207.2510	1109.6877	1010.5191	896.9461	817.2660	802.4876	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	
alpha	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	
util living area	0.9815	0.9674	0.9352	0.8590	0.7216	0.5488	0.4078	0.4600	0.6944	0.9013	0.9691	0.9849	(86)
MIT	19.6282	19.8462	20.1793	20.5592	20.8360	20.9598	20.9909	20.9850	20.8952	20.5211	19.9885	19.5626	(87)
Th 2	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	(88)
util rest of house	0.9781	0.9616	0.9237	0.8350	0.6792	0.4887	0.3372	0.3854	0.6354	0.8787	0.9626	0.9821	(89)
MIT 2	18.5944	18.8696	19.2858	19.7461	20.0590	20.1822	20.2069	20.2034	20.1265	19.7114	19.0527	18.5112	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.7983	19.0623	19.4621	19.9065	20.2123	20.3356	20.3616	20.3576	20.2781	19.8712	19.2373	18.7186	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6483	18.9123	19.3121	19.7565	20.0623	20.1856	20.2116	20.2076	20.1281	19.7212	19.0873	18.5686	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9689	0.9491	0.9077	0.8192	0.6707	0.4867	0.3372	0.3850	0.6287	0.8619	0.9503	0.9740	(94)
Useful gains	819.3559	913.5952	978.6356	983.2053	862.6525	616.5015	407.0655	427.2064	635.3366	773.0707	776.6200	781.6551	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1628.4192	1590.2814	1454.0687	1232.1266	949.0563	633.9214	409.8847	432.1314	684.1432	1035.1806	1360.4621	1630.7236	(97)
Space heating kWh	601.9431	454.7331	353.7222	179.2233	64.2844	0.0000	0.0000	0.0000	0.0000	195.0097	420.3663	631.7070	(98a)
Space heating requirement - total per year (kWh/year)												2900.9891	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	601.9431	454.7331	353.7222	179.2233	64.2844	0.0000	0.0000	0.0000	0.0000	195.0097	420.3663	631.7070	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2900.9891	
Space heating per m2											(98c) / (4) =	21.6864	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	601.9431	454.7331	353.7222	179.2233	64.2844	0.0000	0.0000	0.0000	0.0000	195.0097	420.3663	631.7070	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	676.3406	510.9361	397.4407	201.3745	72.2297	0.0000	0.0000	0.0000	0.0000	219.1120	472.3216	709.7831	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.6009	88.5528	88.4466	88.2342	87.8349	87.3000	87.3000	87.3000	87.3000	88.2660	88.5292	88.6192	(217)
Fuel for water heating, kWh/month	204.4681	179.7902	189.3108	163.3099	156.3826	138.9763	135.5870	142.8443	146.3923	164.6809	178.3696	201.8224	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.4618	-60.0609	-88.8559	-102.9269	-113.5609	-107.0227	-105.7369	-98.5479	-86.1799	-70.0244	-46.1543	-35.6548	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.3933	-41.4888	-84.0948	-128.8611	-172.7937	-174.5094	-172.0747	-144.1775	-103.9228	-59.7933	-26.0286	-15.2705	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3259.5383	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	87.3000	
Water heating fuel used	2001.9345	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2098.5959	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3794.5874	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3259.5383	3.6400	118.6472	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2001.9345	3.6400	72.8704	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	16.4900	-157.6753	
PV Unit electricity exported	-1142.4085	5.5900	-63.8606	
Total			-221.5359	(252)
Total energy cost			166.1507	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3346	(257)
SAP value		94.5763	
SAP rating (Section 12)		95	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3259.5383	0.2100	684.5030	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2001.9345	0.2100	420.4062	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1104.9093	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	0.1340	-128.1068	
PV Unit electricity exported	-1142.4085	0.1254	-143.2342	
Total			-271.3409	(269)
Total CO2, kg/year			922.6469	(272)
CO2 emissions per m2			6.9000	(273)
EI value			93.0841	
EI rating			93	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)			Volume (m3)	
Main dwelling							
Ground floor	47.2300	(1b)	x 2.4000	(2b)	=	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	344.4138	(5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7100 (17)
Infiltration rate		0.1355 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1152 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1238	0.1181	0.1181	0.1094	0.1123	0.0979	0.0979	0.0950	0.0979	0.1094	0.1065	0.1152	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.6774			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.9862 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 56.6636 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	(39)
Average = Sum(39)m / 12 =												113.4919	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	(40)
HLP (average)												0.8484	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041 (42)

Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)

Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month													
	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month													
	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains													
	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	873.0506	973.1863	1093.5629	1234.2992	1311.3327	1335.9490	1265.4193	1174.0231	1060.8660	932.9823	847.6017	826.3379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	
alpha	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	
util living area													
	0.9755	0.9601	0.9187	0.8169	0.6457	0.4339	0.2948	0.3267	0.6028	0.8623	0.9568	0.9797	(86)
MIT	19.7730	19.9671	20.3061	20.6762	20.9066	20.9864	20.9980	20.9970	20.9466	20.6476	20.1444	19.7188	(87)
Th 2	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	(88)
util rest of house													
	0.9709	0.9528	0.9041	0.7866	0.5959	0.3711	0.2249	0.2519	0.5357	0.8315	0.9474	0.9758	(89)
MIT 2	18.7783	19.0223	19.4426	19.8822	20.1316	20.2034	20.2109	20.2105	20.1732	19.8597	19.2484	18.7101	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.9745	19.2087	19.6130	20.0388	20.2845	20.3578	20.3662	20.3656	20.3258	20.0151	19.4252	18.9091	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8245	19.0587	19.4630	19.8888	20.1345	20.2078	20.2162	20.2156	20.1758	19.8651	19.2752	18.7591	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9601	0.9391	0.8874	0.7729	0.5907	0.3708	0.2253	0.2523	0.5325	0.8157	0.9331	0.9661	(94)
Useful gains	838.1911	913.8924	970.4416	953.9643	774.6598	495.3126	285.1588	296.1921	564.8604	761.0631	790.8930	798.3187	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1557.6239	1516.1052	1369.0494	1133.6502	821.0530	500.2553	285.5668	296.8544	587.4091	949.3737	1279.6440	1550.1981	(97)
Space heating kWh													
	535.2580	404.6870	296.5642	129.3738	34.5165	0.0000	0.0000	0.0000	0.0000	140.1031	351.9007	559.3982	(98a)
Space heating requirement - total per year (kWh/year)												2451.8016	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	535.2580	404.6870	296.5642	129.3738	34.5165	0.0000	0.0000	0.0000	0.0000	140.1031	351.9007	559.3982	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2451.8016	
Space heating per m2											(98c) / (4) =	18.3285	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	535.2580	404.6870	296.5642	129.3738	34.5165	0.0000	0.0000	0.0000	0.0000	140.1031	351.9007	559.3982	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	601.4135	454.7045	333.2182	145.3639	38.7826	0.0000	0.0000	0.0000	0.0000	157.4192	395.3940	628.5373	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.5639	88.5134	88.3790	88.0961	87.6362	87.3000	87.3000	87.3000	87.3000	88.1262	88.4664	88.5821	(217)
Fuel for water heating, kWh/month													
	204.5535	179.8703	189.4558	163.5660	156.7371	138.9763	135.5870	142.8443	146.3923	164.9422	178.4963	201.9069	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.7339	-61.9873	-91.0570	-106.1787	-115.2755	-111.6331	-109.7576	-103.8478	-91.4637	-75.6541	-52.2369	-41.3356	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-24.9225	-44.0591	-88.4624	-138.3922	-179.3881	-194.9470	-189.7286	-164.2186	-118.9921	-69.9171	-32.6846	-19.7997	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2754.8332	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2003.3282	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)													
mechanical ventilation fans (SFP = 0.1950)												81.9360	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												167.9360	(231)
Electricity for lighting (calculated in Appendix L)												242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2273.6732	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3116.1987	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2754.8332	7.3200	201.6538	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.3282	7.3200	146.6436	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	27.6700	-278.9582	
PV Unit electricity exported	-1265.5121	5.8100	-73.5263	
Total			-352.4844	(252)
Total energy cost			278.6073	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2754.8332	0.2100	578.5150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2003.3282	0.2100	420.6989	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			999.2139	(265)

Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	0.1342	-135.3132	
PV Unit electricity exported	-1265.5121	0.1253	-158.6057	
Total			-293.9190	(269)
Total CO2, kg/year			794.3735	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2754.8332	1.1300	3112.9615	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.3282	1.1300	2263.7609	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			5376.7224	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	1.4960	-1508.2213	
PV Unit electricity exported	-1265.5121	0.4599	-582.0632	
Total			-2090.2845	(283)
Total Primary energy kWh/year			4247.5272	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: A 95
Current environmental impact rating: A 93

N Solar water heating — SAP increase too small
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.3	-£ 32	-138 kg (17.4%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 95
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£175	£175	£0
Mains gas	£456	£456	£0
Space heating	£356	£356	£0
Water heating	£208	£208	£0
Lighting	£67	£67	£0
Generated (PV)	-£352	-£352	£0
Total cost of fuels	£279	£279	£0
Total cost of uses	£279	£279	£0
Delivered energy	23 kWh/m²	23 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	32 kWh/m²	32 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

Main dwelling	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520 (1b)	- (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309 (1c)	- (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7100	(17)
Infiltration rate		0.1355	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1152	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1468	0.1440	0.1411	0.1267	0.1238	0.1094	0.1094	0.1065	0.1152	0.1238	0.1296	0.1353	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.6774			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		147.9299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.9862	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	56.6636	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	(39)
Average = Sum(39)m / 12 =												113.4919	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	(40)
HLP (average)												0.8484	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
									Total per year (kWh/year) = Sum(64)m =			1763.5798	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			221.3981	(64a)
Heat gains from water heating, kWh/month	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	845.6576	962.6152	1078.1226	1200.1491	1286.2902	1266.6912	1207.2510	1109.6877	1010.5191	896.9461	817.2660	802.4876	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	
alpha	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	
util living area	0.9815	0.9674	0.9352	0.8590	0.7216	0.5488	0.4078	0.4600	0.6944	0.9013	0.9691	0.9849	(86)
MIT	19.6282	19.8462	20.1793	20.5592	20.8360	20.9598	20.9909	20.9850	20.8952	20.5211	19.9885	19.5626	(87)
Th 2	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	(88)
util rest of house	0.9781	0.9616	0.9237	0.8350	0.6792	0.4887	0.3372	0.3854	0.6354	0.8787	0.9626	0.9821	(89)
MIT 2	18.5944	18.8696	19.2858	19.7461	20.0590	20.1822	20.2069	20.2034	20.1265	19.7114	19.0527	18.5112	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.7983	19.0623	19.4621	19.9065	20.2123	20.3356	20.3616	20.3576	20.2781	19.8712	19.2373	18.7186	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6483	18.9123	19.3121	19.7565	20.0623	20.1856	20.2116	20.2076	20.1281	19.7212	19.0873	18.5686	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9689	0.9491	0.9077	0.8192	0.6707	0.4867	0.3372	0.3850	0.6287	0.8619	0.9503	0.9740	(94)
Useful gains	819.3559	913.5952	978.6356	983.2053	862.6525	616.5015	407.0655	427.2064	635.3366	773.0707	776.6200	781.6551	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1628.4192	1590.2814	1454.0687	1232.1266	949.0563	633.9214	409.8847	432.1314	684.1432	1035.1806	1360.4621	1630.7236	(97)
Space heating kWh	601.9431	454.7331	353.7222	179.2233	64.2844	0.0000	0.0000	0.0000	0.0000	195.0097	420.3663	631.7070	(98a)
Space heating requirement - total per year (kWh/year)												2900.9891	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	

Space heating kWh
601.9431 454.7331 353.7222 179.2233 64.2844 0.0000 0.0000 0.0000 0.0000 195.0097 420.3663 631.7070 (98c)
Space heating requirement after solar contribution - total per year (kWh/year) 2900.9891
Space heating per m2 (98c) / (4) = 21.6864 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 89.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	601.9431	454.7331	353.7222	179.2233	64.2844	0.0000	0.0000	0.0000	0.0000	195.0097	420.3663	631.7070	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	676.3406	510.9361	397.4407	201.3745	72.2297	0.0000	0.0000	0.0000	0.0000	219.1120	472.3216	709.7831	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.6009	88.5528	88.4466	88.2342	87.8349	87.3000	87.3000	87.3000	87.3000	88.2660	88.5292	88.6192	(217)
Fuel for water heating, kWh/month													
	204.4681	179.7902	189.3108	163.3099	156.3826	138.9763	135.5870	142.8443	146.3923	164.6809	178.3696	201.8224	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.4618	-60.0609	-88.8559	-102.9269	-113.5609	-107.0227	-105.7369	-98.5479	-86.1799	-70.0244	-46.1543	-35.6548	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.3933	-41.4888	-84.0948	-128.8611	-172.7937	-174.5094	-172.0747	-144.1775	-103.9228	-59.7933	-26.0286	-15.2705	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 3259.5383 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 87.3000
Water heating fuel used 2001.9345 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)
mechanical ventilation fans (SFP = 0.1950) 81.9360 (230a)
central heating pump 41.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 167.9360 (231)
Electricity for lighting (calculated in Appendix L) 242.3764 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -2098.5959 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 3794.5874 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3259.5383	3.6400	118.6472	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2001.9345	3.6400	72.8704	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	16.4900	-157.6753	
PV Unit electricity exported	-1142.4085	5.5900	-63.8606	
Total			-221.5359	(252)
Total energy cost			166.1507	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.3346 (257)

SAP value	94.5763
SAP rating (Section 12)	95 (258)
SAP band	A

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3259.5383	0.2100	684.5030	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2001.9345	0.2100	420.4062	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1104.9093	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	0.1340	-128.1068	
PV Unit electricity exported	-1142.4085	0.1254	-143.2342	
Total			-271.3409	(269)
Total CO2, kg/year			922.6469	(272)
CO2 emissions per m2			6.9000	(273)
EI value			93.0841	
EI rating			93	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.7100 (17)
Infiltration rate		0.1355 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1152 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1238	0.1181	0.1181	0.1094	0.1123	0.0979	0.0979	0.0950	0.0979	0.1094	0.1065	0.1152	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1200	5.6676	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0900	2.8980	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	50.6774		(33)
Main dwelling						
Party Wall 1	150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1	70.0800			9.0000	630.7200	(32c)
Internal Wall 2	86.3900			9.0000	777.5100	(32c)
Internal Wall 3	76.6200			9.0000	689.5800	(32c)
Internal Floor 1	43.2700			18.0000	778.8600	(32d)
Internal Floor 2	43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1	47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2	43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19788.5781	(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		147.9299	(35)	
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965	
E3 Sill	8.3000	0.0170	0.1411	
E4 Jamb	45.3100	0.0130	0.5890	
E5 Ground floor (normal)	9.4700	0.0660	0.6250	
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568	
E18 Party wall between dwellings	30.9600	0.0400	1.2384	
P1 Party wall - Ground floor	19.9400	0.0580	1.1565	
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178	
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096	
E15 Flat roof with parapet	6.4100	0.0890	0.5705	
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.9862	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	56.6636	(37)	

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	113.4919	(39)
Average = Sum(39)m / 12 =												113.4919	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	0.8484	(40)
HLP (average)												0.8484	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.9041	(42)
Hot water usage for mixer showers												
48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths												
31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses												
44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)
Average daily hot water use (litres/day)											114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month													
	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month													
	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains													
	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	873.0506	973.1863	1093.5629	1234.2992	1311.3327	1335.9490	1265.4193	1174.0231	1060.8660	932.9823	847.6017	826.3379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	48.4336	
alpha	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	4.2289	
util living area	0.9755	0.9601	0.9187	0.8169	0.6457	0.4339	0.2948	0.3267	0.6028	0.8623	0.9568	0.9797	(86)
MIT	19.7730	19.9671	20.3061	20.6762	20.9066	20.9864	20.9980	20.9970	20.9466	20.6476	20.1444	19.7188	(87)
Th 2	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	20.2116	(88)
util rest of house	0.9709	0.9528	0.9041	0.7866	0.5959	0.3711	0.2249	0.2519	0.5357	0.8315	0.9474	0.9758	(89)
MIT 2	18.7783	19.0223	19.4426	19.8822	20.1316	20.2034	20.2109	20.2105	20.1732	19.8597	19.2484	18.7101	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.9745	19.2087	19.6130	20.0388	20.2845	20.3578	20.3662	20.3656	20.3258	20.0151	19.4252	18.9091	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8245	19.0587	19.4630	19.8888	20.1345	20.2078	20.2162	20.2156	20.1758	19.8651	19.2752	18.7591	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9601	0.9391	0.8874	0.7729	0.5907	0.3708	0.2253	0.2523	0.5325	0.8157	0.9331	0.9661	(94)
Useful gains	838.1911	913.8924	970.4416	953.9643	774.6598	495.3126	285.1588	296.1921	564.8604	761.0631	790.8930	798.3187	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1557.6239	1516.1052	1369.0494	1133.6502	821.0530	500.2553	285.5668	296.8544	587.4091	949.3737	1279.6440	1550.1981	(97)
Space heating kWh	535.2580	404.6870	296.5642	129.3738	34.5165	0.0000	0.0000	0.0000	0.0000	140.1031	351.9007	559.3982	(98a)
Space heating requirement - total per year (kWh/year)												2451.8016	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	535.2580	404.6870	296.5642	129.3738	34.5165	0.0000	0.0000	0.0000	0.0000	140.1031	351.9007	559.3982	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2451.8016	
Space heating per m2											(98c) / (4) =	18.3285	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	535.2580	404.6870	296.5642	129.3738	34.5165	0.0000	0.0000	0.0000	0.0000	140.1031	351.9007	559.3982	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	601.4135	454.7045	333.2182	145.3639	38.7826	0.0000	0.0000	0.0000	0.0000	157.4192	395.3940	628.5373	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.5639	88.5134	88.3790	88.0961	87.6362	87.3000	87.3000	87.3000	87.3000	88.1262	88.4664	88.5821	(217)
Fuel for water heating, kWh/month	204.5535	179.8703	189.4558	163.5660	156.7371	138.9763	135.5870	142.8443	146.3923	164.9422	178.4963	201.9069	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.7339	-61.9873	-91.0570	-106.1787	-115.2755	-111.6331	-109.7576	-103.8478	-91.4637	-75.6541	-52.2369	-41.3356	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-24.9225	-44.0591	-88.4624	-138.3922	-179.3881	-194.9470	-189.7286	-164.2186	-118.9921	-69.9171	-32.6846	-19.7997	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2754.8332	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2003.3282	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2273.6732	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3116.1987	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2754.8332	7.3200	201.6538	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.3282	7.3200	146.6436	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	27.6700	-278.9582	
PV Unit electricity exported	-1265.5121	5.8100	-73.5263	
Total			-352.4844	(252)
Total energy cost			278.6073	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2754.8332	0.2100	578.5150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2003.3282	0.2100	420.6989	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			999.2139	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	0.1342	-135.3132	
PV Unit electricity exported	-1265.5121	0.1253	-158.6057	
Total			-293.9190	(269)
Total CO2, kg/year			794.3735	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2754.8332	1.1300	3112.9615	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.3282	1.1300	2263.7609	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			5376.7224	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	1.4960	-1508.2213	
PV Unit electricity exported	-1265.5121	0.4599	-582.0632	
Total			-2090.2845	(283)
Total Primary energy kWh/year			4247.5272	(286)

Summary for Input Data

Plot Reference	Plot 58	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	18 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.87	**TER**	9.21
Environmental	92 A	**% DER < TER**			14.55
CO_2 Emissions (t/year)	0.89	**DFEE**	28.67	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			11.04
% DPER < TPER	10.96	**DPER**	42.74	**TPER**	48.00

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, Mid-Terrace	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	147.93	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	9.47 m	47.23 m²	2.40 m
1st Storey:	9.47 m	43.27 m²	2.67 m
2nd Storey:	9.47 m	43.27 m²	2.67 m

8.0 Living Area 26.39 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.25	60.00	73.30	49.03	0.00	None	24.27	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	150.34	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	70.08
Internal Wall 2	Plasterboard on timber frame	9.00	86.39
Internal Wall 3	Plasterboard on timber frame	9.00	76.62

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof-500mm	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	32.20	32.20	None	0.00	Enter Gross Area	0.00
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.91	3.91	None	0.00	Enter Gross Area	0.00
Sloping	External Slope Roof	Plasterboard, insulated slope	0.14	9.00	10.21	10.21	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.23
Internal Ceiling 2	+2	Plasterboard ceiling, carpeted chipboard floor	9.00	43.27

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground FLoor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	47.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27
Internal Floor 2	+2	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Front Door	Brickwork	South East	2.15	
Patio Door	Patio Door	Brickwork	North West	5.85	
NW	Window	Brickwork	North West	7.16	
SE	Window	Brickwork	South East	9.12	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging — Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	11.93	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.30	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	45.31	0.01	0.01	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	9.47	0.07	0.07	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	18.95	0.00	0.00	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	30.96	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	19.94	0.06	0.06	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	36.54	0.00	0.00		No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	19.94	0.04	0.04	RCD	No
E13 Gable (insulation at rafter level)	Non Gov Approved Schemes	2.47	0.00	0.00	RCD	No
E15 Flat roof with parapet	Independently assessed	6.41	0.09	0.09	AbbeyCalculated	No
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	7.12	0.04	0.04	RCD	No

Y-value: 0.04 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500755
Duct Type	Rigid
Wet Rooms	5

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	1
0.15	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0
0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.68	m³/(h.m²) @ 50 Pa
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
PD	106.00	8.00	848.00	12
DL	106.00	8.00	848.00	26

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18123	
Fuel Type	Mains gas	
In Winter	89.00	
In Summer	87.30	
Model Name	LOGIC CODE COMBI ESP1	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	Standard Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	
28.0 Water Heating		
Water Heating	Main Heating 1	

Summary for Input Data

SAP Code	901
Flue Gas Heat Recovery System	Yes
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1
Ensuite 2	Instantaneous electric shower		9.30	No	

28.2 Flue Gas Heat Recovery System

Database ID	0
Brand Model	
Details	

28.3 Waste Water Heat Recovery System

Instantaneous System 1

Database ID	80116
Brand Model	Showersave, QB1-21
Details	Year: 2017 + current Efficiency: 69.85 Utilisation factor: 0.973

29.0 Hot Water Cylinder None

32.0 Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
1.62	South	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	Plot 58	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	18 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.87	**TER**	9.21
Environmental	92 A	**% DER < TER**			14.55
CO_2 Emissions (t/year)	0.89	**DFEE**	28.67	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			11.04
% DPER < TPER	10.96	**DPER**	42.74	**TPER**	48.00

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6800	(17)
Infiltration rate		0.1340	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1139	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1452	0.1424	0.1395	0.1253	0.1224	0.1082	0.1082	0.1054	0.1139	0.1224	0.1281	0.1338	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.1000	3.2200	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.5271			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200		9.0000	689.5800 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.5133 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	(39)
Average = Sum(39)m / 12 =												113.3416	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	(40)
HLP (average)												0.8473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
12Total per year (kWh/year)												1764	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	626.2393	643.8310	614.4600	593.2546	560.7645	536.8373	514.5467	514.6767	531.6441	553.1095	588.8766	611.6974	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	773.6520	909.8304	1017.9920	1159.5924	1255.6640	1253.3473	1194.2543	1094.3994	990.9142	857.7673	768.1567	736.0960	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	
alpha	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	
util living area	0.9865	0.9729	0.9454	0.8701	0.7323	0.5532	0.4115	0.4654	0.7032	0.9125	0.9749	0.9889	(86)
MIT	19.5449	19.7897	20.1228	20.5331	20.8267	20.9588	20.9906	20.9844	20.8902	20.4899	19.9353	19.4849	(87)
Th 2	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	(88)
util rest of house	0.9839	0.9680	0.9354	0.8472	0.6904	0.4930	0.3404	0.3901	0.6445	0.8917	0.9695	0.9869	(89)
MIT 2	18.4897	18.7996	19.2175	19.7171	20.0507	20.1823	20.2077	20.2040	20.1231	19.6760	18.9869	18.4134	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6978	18.9949	19.3961	19.8781	20.2038	20.3355	20.3622	20.3580	20.2744	19.8366	19.1740	18.6248	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5478	18.8449	19.2461	19.7281	20.0538	20.1855	20.2122	20.2080	20.1244	19.6866	19.0240	18.4748	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9764	0.9566	0.9201	0.8311	0.6813	0.4908	0.3404	0.3897	0.6374	0.8749	0.9583	0.9802	(94)
Useful gains	755.3814	870.3654	936.6509	963.7703	855.4932	615.1780	406.5044	426.4729	631.6422	750.4523	736.1619	721.5545	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1614.8721	1580.5373	1444.6668	1227.2700	946.8313	633.0704	409.4103	431.6020	682.8159	1029.8862	1351.4862	1617.9259	(97)
Space heating kWh	639.4611	477.2356	377.9638	189.7198	67.9555	0.0000	0.0000	0.0000	0.0000	207.8988	443.0335	666.9003	(98a)
Space heating requirement - total per year (kWh/year)												3070.1684	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	639.4611	477.2356	377.9638	189.7198	67.9555	0.0000	0.0000	0.0000	0.0000	207.8988	443.0335	666.9003	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3070.1684	
Space heating per m2											(98c) / (4) =	22.9511	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	639.4611	477.2356	377.9638	189.7198	67.9555	0.0000	0.0000	0.0000	0.0000	207.8988	443.0335	666.9003	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	718.4956	536.2197	424.6785	213.1683	76.3545	0.0000	0.0000	0.0000	0.0000	233.5941	497.7904	749.3262	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.6190	88.5686	88.4711	88.2581	87.8554	87.3000	87.3000	87.3000	87.3000	88.2925	88.5469	88.6350	(217)
Fuel for water heating, kWh/month	204.4262	179.7582	189.2585	163.2657	156.3460	138.9763	135.5870	142.8443	146.3923	164.6314	178.3340	201.7864	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6991	-44.1757	-67.0999	-79.8758	-90.0131	-85.5051	-84.4585	-77.7704	-66.6211	-52.3995	-33.4555	-25.4097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8710	-23.5240	-48.2006	-74.6496	-100.8899	-102.1830	-100.7492	-84.0465	-60.1140	-34.1457	-14.6664	-8.5406	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3449.6274	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2001.6064	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1399.0639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4683.8804	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3449.6274	0.2100	724.4217	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2001.6064	0.2100	420.3373	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1144.7591	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	0.1334	-98.2728	
PV Unit electricity exported	-662.5806	0.1251	-82.8740	
Total			-181.1468	(269)
Total CO2, kg/year			1052.6909	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.8700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3449.6274	1.1300	3898.0789	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2001.6064	1.1300	2261.8153	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6159.8942	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	1.4931	-1099.6344	
PV Unit electricity exported	-662.5806	0.4591	-304.1784	
Total			-1403.8128	(283)
Total Primary energy kWh/year			5717.1707	(286)
Dwelling Primary energy Rate (DPER)			42.7400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3661	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.0546	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9858	0.9734	0.9491	0.8821	0.7574	0.5808	0.4368	0.4905	0.7261	0.9182	0.9747	0.9881	(86)
MIT	19.3267	19.5811	19.9398	20.4095	20.7577	20.9376	20.9842	20.9754	20.8487	20.3847	19.7818	19.2898	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9831	0.9684	0.9392	0.8596	0.7141	0.5151	0.3565	0.4067	0.6647	0.8975	0.9690	0.9858	(89)
MIT 2	18.1517	18.4755	18.9281	19.5109	19.9128	20.1029	20.1405	20.1368	20.0217	19.4939	18.7399	18.1104	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9573	0.9249	0.8461	0.7109	0.5247	0.3717	0.4222	0.6678	0.8838	0.9584	0.9790	(94)
Useful gains	779.8988	895.5847	964.6773	1000.6973	908.3651	668.6617	451.4744	470.7475	675.9424	777.9455	759.4567	745.8018	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1793.9332	1752.2154	1599.8074	1349.4991	1045.6941	699.3647	457.4319	480.5183	754.1209	1131.8210	1485.3829	1782.4521	(97)
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98a)
Space heating requirement - total per year (kWh/year)												3713.1625	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3713.1625	
Space heating per m2											(98c) / (4) =	27.7578	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	816.4952	623.0042	511.4035	271.7936	110.5766	0.0000	0.0000	0.0000	0.0000	284.9388	565.6568	834.7055	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.5701	86.3118	85.8221	84.7688	82.9827	80.3000	80.3000	80.3000	80.3000	84.8433	86.1226	86.6251	(217)
Fuel for water heating, kWh/month													
	292.5137	259.3615	277.2051	247.3844	245.3111	228.8498	226.3471	235.2227	237.6393	250.2827	261.4890	289.2525	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4018.5742	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3050.8589	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	264.9585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5085.9305	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4018.5742	0.2100	843.9006	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3050.8589	0.2100	640.6804	(264)
Space and water heating			1484.5810	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1232.5839	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4018.5742	1.1300	4540.9888	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3050.8589	1.1300	3447.4706	(278)
Space and water heating			7988.4594	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			6421.2881	(286)
Target Primary Energy Rate (TPER)			48.0000	(287)

Full SAP Calculation Printout

Plot Reference	Plot 58	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	18 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.87	**TER**	9.21
Environmental	92 A	**% DER < TER**			14.55
CO_2 Emissions (t/year)	0.89	**DFEE**	28.67	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			11.04
% DPER < TPER	10.96	**DPER**	42.74	**TPER**	48.00

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		4 * 10 =	40.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		40.0000 / (5) =	0.1161	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			2.6800	(17)
Infiltration rate			0.2501	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2126	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2711	0.2658	0.2605	0.2339	0.2286	0.2020	0.2020	0.1967	0.2126	0.2286	0.2392	0.2498	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5367	0.5353	0.5339	0.5273	0.5261	0.5204	0.5204	0.5193	0.5226	0.5261	0.5286	0.5312	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.1000	3.2200	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.5271			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)

Internal Floor 2	43.2700	18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300	9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700	9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.5133 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.0045	60.8424	60.6834	59.9368	59.7971	59.1468	59.1468	59.0264	59.3973	59.7971	60.0797	60.3751	(38)
Heat transfer coeff	117.5179	117.3557	117.1967	116.4501	116.3104	115.6601	115.6601	115.5397	115.9106	116.3104	116.5930	116.8885	(39)
Average = Sum(39)m / 12 =												116.4494	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8785	0.8773	0.8761	0.8705	0.8695	0.8646	0.8646	0.8637	0.8665	0.8695	0.8716	0.8738	(40)
HLP (average)												0.8705	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
								Total per year (kWh/year) = Sum(64)m =			981.4310	(64)
12Total per year (kWh/year)											981	(64)

Electric shower(s)

58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							664.1943	(64a)

Heat gains from water heating, kWh/month

40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Northwest			5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)				
Southeast			9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)				
Northwest			7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)				
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.7744	46.8390	46.9026	47.2033	47.2600	47.5257	47.5257	47.5752	47.4230	47.2600	47.1454	47.0263	
alpha	4.1183	4.1226	4.1268	4.1469	4.1507	4.1684	4.1684	4.1717	4.1615	4.1507	4.1430	4.1351	
util living area	0.9893	0.9779	0.9542	0.8849	0.7535	0.5718	0.4271	0.4833	0.7249	0.9250	0.9797	0.9913	(86)
MIT	19.4144	19.6680	20.0189	20.4691	20.7949	20.9506	20.9884	20.9809	20.8701	20.4265	19.8395	19.3659	(87)
Th 2	20.1858	20.1868	20.1879	20.1926	20.1935	20.1977	20.1977	20.1984	20.1961	20.1935	20.1917	20.1898	(88)
util rest of house	0.9873	0.9737	0.9453	0.8635	0.7118	0.5096	0.3524	0.4046	0.6660	0.9062	0.9751	0.9896	(89)
MIT 2	18.7204	18.9721	19.3173	19.7512	20.0433	20.1694	20.1930	20.1903	20.1129	19.7202	19.1475	18.6753	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.8573	19.1094	19.4557	19.8928	20.1915	20.3235	20.3499	20.3463	20.2623	19.8595	19.2840	18.8116	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8573	19.1094	19.4557	19.8928	20.1915	20.3235	20.3499	20.3463	20.2623	19.8595	19.2840	18.8116	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9666	0.9357	0.8545	0.7117	0.5197	0.3668	0.4195	0.6712	0.8969	0.9684	0.9857	(94)
Useful gains	715.5562	836.5461	913.2232	959.8627	870.3369	637.7088	429.3380	448.3778	646.6595	738.3723	705.1254	681.4624	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1710.7436	1667.5523	1518.3696	1280.1131	987.6546	661.9793	433.7195	455.9490	714.2706	1076.9819	1420.5703	1707.9224	(97)
Space heating kWh	740.4194	558.4362	450.2289	230.5803	87.2844	0.0000	0.0000	0.0000	0.0000	251.9256	515.1203	763.6863	(98a)
Space heating requirement - total per year (kWh/year)												3597.6814	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	740.4194	558.4362	450.2289	230.5803	87.2844	0.0000	0.0000	0.0000	0.0000	251.9256	515.1203	763.6863	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3597.6814	
Space heating per m2											(98c) / (4) =	26.8945	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1087.2053	855.8851	878.1019	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8857	0.9324	0.9058	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	962.9022	798.0501	795.3942	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	288.3660	373.6798	289.7373	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	72.0915	93.4199	72.4343	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												237.9458	(107)
Energy for space heating												26.8945	(99)
Energy for space cooling												1.7788	(108)
Total												28.6733	(109)
Fabric Energy Efficiency (DFEE)												28.7	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.0546	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	69.5228	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	

Distribution loss (46)m = 0.15 x (45)m

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
										Total per year (kWh/year) = Sum(64)m =		981.4310	(64)
12Total per year (kWh/year)												981	(64)
Electric shower(s)													
	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		664.1943	(64a)
Heat gains from water heating, kWh/month													
	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains													
	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9896	0.9793	0.9581	0.8963	0.7761	0.5987	0.4518	0.5091	0.7481	0.9319	0.9808	0.9915	(86)
MIT	19.2421	19.5020	19.8713	20.3636	20.7342	20.9305	20.9822	20.9719	20.8308	20.3331	19.7087	19.2054	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9876	0.9752	0.9497	0.8756	0.7340	0.5322	0.3694	0.4232	0.6879	0.9138	0.9763	0.9898	(89)
MIT 2	18.5031	18.7621	19.1270	19.6076	19.9441	20.1086	20.1414	20.1381	20.0362	19.5890	18.9765	18.4729	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6489	18.9081	19.2738	19.7567	20.1000	20.2708	20.3073	20.3026	20.1930	19.7358	19.1209	18.6174	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6489	18.9081	19.2738	19.7567	20.1000	20.2708	20.3073	20.3026	20.1930	19.7358	19.1209	18.6174	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9828	0.9678	0.9395	0.8650	0.7319	0.5422	0.3851	0.4391	0.6916	0.9035	0.9694	0.9857	(94)
Useful gains	715.6229	837.5678	916.9247	971.7452	895.0082	665.3041	450.7186	469.3420	666.3008	743.8142	705.8243	681.4346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1827.7387	1779.4634	1618.3197	1358.0798	1048.2448	699.7643	457.4740	480.5706	755.1334	1140.0729	1507.3889	1817.0266	(97)
Space heating kWh													
	827.4142	632.9538	521.8379	278.1609	114.0080	0.0000	0.0000	0.0000	0.0000	294.8165	577.1265	844.8804	(98a)
Space heating requirement - total per year (kWh/year)												4091.1982	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	827.4142	632.9538	521.8379	278.1609	114.0080	0.0000	0.0000	0.0000	0.0000	294.8165	577.1265	844.8804	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4091.1982	
Space heating per m2											(98c) / (4) =	30.5838	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1159.9452	913.1484	935.8672	0.0000	0.0000	0.0000	0.0000	(100)

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8577	0.9115	0.8809	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	994.8804	832.3652	824.4242	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	265.3417	348.1494	268.1389	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction										fC = cooled area / (4) =		1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	66.3354	87.0373	67.0347	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												220.4075 (107)
Energy for space heating												30.5838 (99)
Energy for space cooling												1.6477 (108)
Total												32.2315 (109)
Fabric Energy Efficiency (TFEE)												32.2 (109)

Full SAP Calculation Printout

Plot Reference	Plot 58	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	18 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.87	**TER**	9.21
Environmental	92 A	**% DER < TER**			14.55
CO_2 Emissions (t/year)	0.89	**DFEE**	28.67	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			11.04
% DPER < TPER	10.96	**DPER**	42.74	**TPER**	48.00

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6800	(17)
Infiltration rate		0.1340	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1139	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1452	0.1424	0.1395	0.1253	0.1224	0.1082	0.1082	0.1054	0.1139	0.1224	0.1281	0.1338	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.1000	3.2200	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.5271			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200		9.0000	689.5800 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.5133 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	(39)
Average = Sum(39)m / 12 =												113.3416	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	(40)
HLP (average)												0.8473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
12Total per year (kWh/year)												1764	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	626.2393	643.8310	614.4600	593.2546	560.7645	536.8373	514.5467	514.6767	531.6441	553.1095	588.8766	611.6974	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	773.6520	909.8304	1017.9920	1159.5924	1255.6640	1253.3473	1194.2543	1094.3994	990.9142	857.7673	768.1567	736.0960	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	
alpha	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	
util living area	0.9865	0.9729	0.9454	0.8701	0.7323	0.5532	0.4115	0.4654	0.7032	0.9125	0.9749	0.9889	(86)
MIT	19.5449	19.7897	20.1228	20.5331	20.8267	20.9588	20.9906	20.9844	20.8902	20.4899	19.9353	19.4849	(87)
Th 2	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	(88)
util rest of house	0.9839	0.9680	0.9354	0.8472	0.6904	0.4930	0.3404	0.3901	0.6445	0.8917	0.9695	0.9869	(89)
MIT 2	18.4897	18.7996	19.2175	19.7171	20.0507	20.1823	20.2077	20.2040	20.1231	19.6760	18.9869	18.4134	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6978	18.9949	19.3961	19.8781	20.2038	20.3355	20.3622	20.3580	20.2744	19.8366	19.1740	18.6248	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5478	18.8449	19.2461	19.7281	20.0538	20.1855	20.2122	20.2080	20.1244	19.6866	19.0240	18.4748	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9764	0.9566	0.9201	0.8311	0.6813	0.4908	0.3404	0.3897	0.6374	0.8749	0.9583	0.9802	(94)
Useful gains	755.3814	870.3654	936.6509	963.7703	855.4932	615.1780	406.5044	426.4729	631.6422	750.4523	736.1619	721.5545	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1614.8721	1580.5373	1444.6668	1227.2700	946.8313	633.0704	409.4103	431.6020	682.8159	1029.8862	1351.4862	1617.9259	(97)
Space heating kWh	639.4611	477.2356	377.9638	189.7198	67.9555	0.0000	0.0000	0.0000	0.0000	207.8988	443.0335	666.9003	(98a)
Space heating requirement - total per year (kWh/year)												3070.1684	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	639.4611	477.2356	377.9638	189.7198	67.9555	0.0000	0.0000	0.0000	0.0000	207.8988	443.0335	666.9003	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3070.1684	
Space heating per m2											(98c) / (4) =	22.9511	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	639.4611	477.2356	377.9638	189.7198	67.9555	0.0000	0.0000	0.0000	0.0000	207.8988	443.0335	666.9003	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	718.4956	536.2197	424.6785	213.1683	76.3545	0.0000	0.0000	0.0000	0.0000	233.5941	497.7904	749.3262	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.6190	88.5686	88.4711	88.2581	87.8554	87.3000	87.3000	87.3000	87.3000	88.2925	88.5469	88.6350	(217)
Fuel for water heating, kWh/month	204.4262	179.7582	189.2585	163.2657	156.3460	138.9763	135.5870	142.8443	146.3923	164.6314	178.3340	201.7864	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6991	-44.1757	-67.0999	-79.8758	-90.0131	-85.5051	-84.4585	-77.7704	-66.6211	-52.3995	-33.4555	-25.4097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8710	-23.5240	-48.2006	-74.6496	-100.8899	-102.1830	-100.7492	-84.0465	-60.1140	-34.1457	-14.6664	-8.5406	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3449.6274	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2001.6064	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1399.0639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4683.8804	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3449.6274	0.2100	724.4217	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2001.6064	0.2100	420.3373	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1144.7591	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	0.1334	-98.2728	
PV Unit electricity exported	-662.5806	0.1251	-82.8740	
Total			-181.1468	(269)
Total CO2, kg/year			1052.6909	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.8700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3449.6274	1.1300	3898.0789	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2001.6064	1.1300	2261.8153	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6159.8942	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	1.4931	-1099.6344	
PV Unit electricity exported	-662.5806	0.4591	-304.1784	
Total			-1403.8128	(283)
Total Primary energy kWh/year			5717.1707	(286)
Dwelling Primary energy Rate (DPER)			42.7400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3661	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.0546	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9858	0.9734	0.9491	0.8821	0.7574	0.5808	0.4368	0.4905	0.7261	0.9182	0.9747	0.9881	(86)
MIT	19.3267	19.5811	19.9398	20.4095	20.7577	20.9376	20.9842	20.9754	20.8487	20.3847	19.7818	19.2898	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9831	0.9684	0.9392	0.8596	0.7141	0.5151	0.3565	0.4067	0.6647	0.8975	0.9690	0.9858	(89)
MIT 2	18.1517	18.4755	18.9281	19.5109	19.9128	20.1029	20.1405	20.1368	20.0217	19.4939	18.7399	18.1104	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9573	0.9249	0.8461	0.7109	0.5247	0.3717	0.4222	0.6678	0.8838	0.9584	0.9790	(94)
Useful gains	779.8988	895.5847	964.6773	1000.6973	908.3651	668.6617	451.4744	470.7475	675.9424	777.9455	759.4567	745.8018	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1793.9332	1752.2154	1599.8074	1349.4991	1045.6941	699.3647	457.4319	480.5183	754.1209	1131.8210	1485.3829	1782.4521	(97)
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98a)
Space heating requirement - total per year (kWh/year)												3713.1625	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3713.1625	
Space heating per m2											(98c) / (4) =	27.7578	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	816.4952	623.0042	511.4035	271.7936	110.5766	0.0000	0.0000	0.0000	0.0000	284.9388	565.6568	834.7055	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.5701	86.3118	85.8221	84.7688	82.9827	80.3000	80.3000	80.3000	80.3000	84.8433	86.1226	86.6251	(217)
Fuel for water heating, kWh/month													
	292.5137	259.3615	277.2051	247.3844	245.3111	228.8498	226.3471	235.2227	237.6393	250.2827	261.4890	289.2525	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4018.5742	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3050.8589	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	264.9585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5085.9305	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4018.5742	0.2100	843.9006	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3050.8589	0.2100	640.6804	(264)
Space and water heating			1484.5810	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1232.5839	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4018.5742	1.1300	4540.9888	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3050.8589	1.1300	3447.4706	(278)
Space and water heating			7988.4594	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			6421.2881	(286)
Target Primary Energy Rate (TPER)			48.0000	(287)

Full SAP Calculation Printout

Plot Reference	Plot 58	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	18 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.87	**TER**	9.21
Environmental	92 A	**% DER < TER**			14.55
CO_2 Emissions (t/year)	0.89	**DFEE**	28.67	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			11.04
% DPER < TPER	10.96	**DPER**	42.74	**TPER**	48.00

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6800	(17)
Infiltration rate		0.1340	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1139	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1452	0.1424	0.1395	0.1253	0.1224	0.1082	0.1082	0.1054	0.1139	0.1224	0.1281	0.1338	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.1000	3.2200	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.5271			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200		9.0000	689.5800 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.5133 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	(39)
Average = Sum(39)m / 12 =												113.3416	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	(40)
HLP (average)												0.8473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northwest					5.8500	11.2829		0.6300	0.7000	0.7700		20.1720	(81)
Southeast					9.1200	36.7938		0.6300	0.7000	0.7700		102.5514	(77)
Northwest					7.1600	11.2829		0.6300	0.7000	0.7700		24.6892	(81)
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	845.6576	962.6152	1078.1226	1200.1491	1286.2902	1266.6912	1207.2510	1109.6877	1010.5191	896.9461	817.2660	802.4876	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	
alpha	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	
util living area	0.9815	0.9673	0.9351	0.8587	0.7211	0.5482	0.4073	0.4595	0.6939	0.9011	0.9691	0.9849	(86)
MIT	19.6309	19.8489	20.1817	20.5609	20.8370	20.9601	20.9910	20.9852	20.8958	20.5228	19.9908	19.5653	(87)
Th 2	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	(88)
util rest of house	0.9781	0.9615	0.9236	0.8347	0.6788	0.4883	0.3368	0.3850	0.6350	0.8785	0.9626	0.9821	(89)
MIT 2	18.5986	18.8737	19.2895	19.7490	20.0609	20.1834	20.2079	20.2044	20.1280	19.7141	19.0563	18.5154	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.8022	19.0661	19.4655	19.9091	20.2140	20.3366	20.3624	20.3585	20.2794	19.8737	19.2406	18.7225	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6522	18.9161	19.3155	19.7591	20.0640	20.1866	20.2124	20.2085	20.1294	19.7237	19.0906	18.5725	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9689	0.9490	0.9076	0.8190	0.6702	0.4862	0.3368	0.3846	0.6283	0.8617	0.9502	0.9740	(94)
Useful gains	819.3400	913.5481	978.5069	982.8844	862.0896	615.9169	406.6440	426.7762	634.8840	772.8978	776.5827	781.6454	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1626.7040	1588.6044	1452.5276	1230.7924	947.9878	633.1972	409.4355	431.6563	683.3860	1034.0901	1359.0386	1629.0062	(97)
Space heating kWh	600.6789	453.6378	352.6714	178.4938	63.9082	0.0000	0.0000	0.0000	0.0000	194.3271	419.3683	630.4364	(98a)
Space heating requirement - total per year (kWh/year)												2893.5219	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	600.6789	453.6378	352.6714	178.4938	63.9082	0.0000	0.0000	0.0000	0.0000	194.3271	419.3683	630.4364	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2893.5219	
Space heating per m2											(98c) / (4) =	21.6306	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	600.6789	453.6378	352.6714	178.4938	63.9082	0.0000	0.0000	0.0000	0.0000	194.3271	419.3683	630.4364	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	674.9201	509.7054	396.2600	200.5548	71.8070	0.0000	0.0000	0.0000	0.0000	218.3450	471.2003	708.3556	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.6002	88.5520	88.4455	88.2325	87.8327	87.3000	87.3000	87.3000	87.3000	88.2645	88.5284	88.6186	(217)
Fuel for water heating, kWh/month	204.4696	179.7918	189.3132	163.3131	156.3864	138.9763	135.5870	142.8443	146.3923	164.6837	178.3712	201.8237	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6991	-44.1757	-67.0999	-79.8758	-90.0131	-85.5051	-84.4585	-77.7704	-66.6211	-52.3995	-33.4555	-25.4097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8710	-23.5240	-48.2006	-74.6496	-100.8899	-102.1830	-100.7492	-84.0465	-60.1140	-34.1457	-14.6664	-8.5406	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3251.1482	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	87.3000	
Water heating fuel used	2001.9527	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1399.0639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4485.7475	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3251.1482	3.6400	118.3418	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2001.9527	3.6400	72.8711	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	16.4900	-121.4461	
PV Unit electricity exported	-662.5806	5.5900	-37.0383	
Total			-158.4844	(252)
Total energy cost			228.8976	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4609	(257)
SAP value		92.5281	
SAP rating (Section 12)		93	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3251.1482	0.2100	682.7411	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2001.9527	0.2100	420.4101	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1103.1512	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	0.1334	-98.2728	
PV Unit electricity exported	-662.5806	0.1251	-82.8740	
Total			-181.1468	(269)
Total CO2, kg/year			1011.0830	(272)
CO2 emissions per m2			7.5600	(273)
EI value			92.4213	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)			Volume (m3)	
Main dwelling							
Ground floor	47.2300	(1b)	x 2.4000	(2b)	=	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	344.4138	(5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6800	(17)
Infiltration rate		0.1340	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1139	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1224	0.1167	0.1167	0.1082	0.1111	0.0968	0.0968	0.0940	0.0968	0.1082	0.1054	0.1139	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.1000	3.2200	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.5271			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		147.9299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.9862 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	56.5133 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	(39)
Average = Sum(39)m / 12 =												113.3416	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	(40)
HLP (average)												0.8473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.9041 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)

Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month													
	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month													
	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains													
	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	873.0506	973.1863	1093.5629	1234.2992	1311.3327	1335.9490	1265.4193	1174.0231	1060.8660	932.9823	847.6017	826.3379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	
alpha	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	
util living area													
	0.9755	0.9600	0.9185	0.8166	0.6452	0.4333	0.2944	0.3263	0.6022	0.8620	0.9567	0.9797	(86)
MIT	19.7756	19.9697	20.3083	20.6777	20.9072	20.9865	20.9980	20.9970	20.9470	20.6490	20.1466	19.7214	(87)
Th 2	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	(88)
util rest of house													
	0.9709	0.9527	0.9039	0.7862	0.5954	0.3707	0.2247	0.2517	0.5352	0.8312	0.9473	0.9758	(89)
MIT 2	18.7823	19.0262	19.4460	19.8846	20.1331	20.2044	20.2119	20.2115	20.1744	19.8620	19.2518	18.7141	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.9783	19.2123	19.6161	20.0411	20.2858	20.3587	20.3670	20.3664	20.3268	20.0173	19.4283	18.9128	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8283	19.0623	19.4661	19.8911	20.1358	20.2087	20.2170	20.2164	20.1768	19.8673	19.2783	18.7628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9600	0.9390	0.8873	0.7725	0.5903	0.3704	0.2251	0.2520	0.5320	0.8155	0.9330	0.9661	(94)
Useful gains	838.1636	913.8289	970.2727	953.5526	774.0377	494.7941	284.8741	295.8957	564.3697	760.8158	790.8307	798.3001	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1555.9853	1514.5071	1367.5941	1132.4066	820.1153	499.6901	285.2776	296.5508	586.7522	948.3631	1278.3055	1548.5685	(97)
Space heating kWh													
	534.0593	403.6557	295.6072	128.7749	34.2817	0.0000	0.0000	0.0000	0.0000	139.5352	350.9818	558.1997	(98a)
Space heating requirement - total per year (kWh/year)												2445.0956	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	534.0593	403.6557	295.6072	128.7749	34.2817	0.0000	0.0000	0.0000	0.0000	139.5352	350.9818	558.1997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2445.0956	
Space heating per m2											(98c) / (4) =	18.2784	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	534.0593	403.6557	295.6072	128.7749	34.2817	0.0000	0.0000	0.0000	0.0000	139.5352	350.9818	558.1997	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	600.0667	453.5458	332.1429	144.6909	38.5188	0.0000	0.0000	0.0000	0.0000	156.7811	394.3616	627.1907	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.5632	88.5125	88.3777	88.0941	87.6343	87.3000	87.3000	87.3000	87.3000	88.1244	88.4654	88.5814	(217)
Fuel for water heating, kWh/month													
	204.5552	179.8721	189.4586	163.5697	156.7404	138.9763	135.5870	142.8443	146.3923	164.9454	178.4983	201.9085	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.4253	-45.6931	-68.9270	-82.7482	-91.6053	-89.9100	-88.2926	-82.6756	-71.2664	-57.0077	-38.1399	-29.6511	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.0123	-25.0045	-50.7526	-80.2991	-104.8371	-114.4767	-111.3649	-96.0353	-69.0375	-40.0397	-18.4745	-11.1058	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2747.2984	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2003.3481	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)													
mechanical ventilation fans (SFP = 0.1950)												81.9360	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												167.9360	(231)
Electricity for lighting (calculated in Appendix L)												242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1515.7821	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3866.5748	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2747.2984	7.3200	201.1022	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.3481	7.3200	146.6451	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	27.6700	-215.9207	
PV Unit electricity exported	-735.4399	5.8100	-42.7291	
Total			-258.6498	(252)
Total energy cost			371.8918	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2747.2984	0.2100	576.9327	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2003.3481	0.2100	420.7031	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			997.6358	(265)

Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	0.1336	-104.2821	
PV Unit electricity exported	-735.4399	0.1250	-91.9297	
Total			-196.2118	(269)
Total CO2, kg/year			890.5025	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2747.2984	1.1300	3104.4472	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.3481	1.1300	2263.7833	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			5368.2305	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	1.4938	-1165.6983	
PV Unit electricity exported	-735.4399	0.4587	-337.3578	
Total			-1503.0562	(283)
Total Primary energy kWh/year			4826.2636	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: A 93
Current environmental impact rating: A 92

N Solar water heating — SAP increase too small
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.3	-£ 31	-138 kg (15.5%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 93
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£175	£175	£0
Mains gas	£456	£456	£0
Space heating	£356	£356	£0
Water heating	£208	£208	£0
Lighting	£67	£67	£0
Generated (PV)	-£259	-£259	£0
Total cost of fuels	£372	£372	£0
Total cost of uses	£372	£372	£0
Delivered energy	29 kWh/m²	29 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	36 kWh/m²	36 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6800	(17)
Infiltration rate		0.1340	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1139	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1452	0.1424	0.1395	0.1253	0.1224	0.1082	0.1082	0.1054	0.1139	0.1224	0.1281	0.1338	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.1000	3.2200	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.5271			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		147.9299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.9862 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	56.5133 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	(39)
Average = Sum(39)m / 12 =												113.3416	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	(40)
HLP (average)												0.8473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	845.6576	962.6152	1078.1226	1200.1491	1286.2902	1266.6912	1207.2510	1109.6877	1010.5191	896.9461	817.2660	802.4876	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	
alpha	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	
util living area	0.9815	0.9673	0.9351	0.8587	0.7211	0.5482	0.4073	0.4595	0.6939	0.9011	0.9691	0.9849	(86)
MIT	19.6309	19.8489	20.1817	20.5609	20.8370	20.9601	20.9910	20.9852	20.8958	20.5228	19.9908	19.5653	(87)
Th 2	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	(88)
util rest of house	0.9781	0.9615	0.9236	0.8347	0.6788	0.4883	0.3368	0.3850	0.6350	0.8785	0.9626	0.9821	(89)
MIT 2	18.5986	18.8737	19.2895	19.7490	20.0609	20.1834	20.2079	20.2044	20.1280	19.7141	19.0563	18.5154	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.8022	19.0661	19.4655	19.9091	20.2140	20.3366	20.3624	20.3585	20.2794	19.8737	19.2406	18.7225	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6522	18.9161	19.3155	19.7591	20.0640	20.1866	20.2124	20.2085	20.1294	19.7237	19.0906	18.5725	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9689	0.9490	0.9076	0.8190	0.6702	0.4862	0.3368	0.3846	0.6283	0.8617	0.9502	0.9740	(94)
Useful gains	819.3400	913.5481	978.5069	982.8844	862.0896	615.9169	406.6440	426.7762	634.8840	772.8978	776.5827	781.6454	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1626.7040	1588.6044	1452.5276	1230.7924	947.9878	633.1972	409.4355	431.6563	683.3860	1034.0901	1359.0386	1629.0062	(97)
Space heating kWh	600.6789	453.6378	352.6714	178.4938	63.9082	0.0000	0.0000	0.0000	0.0000	194.3271	419.3683	630.4364	(98a)
Space heating requirement - total per year (kWh/year)												2893.5219	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	

Space heating kWh
600.6789 453.6378 352.6714 178.4938 63.9082 0.0000 0.0000 0.0000 0.0000 194.3271 419.3683 630.4364 (98c)
Space heating requirement after solar contribution - total per year (kWh/year) 2893.5219
Space heating per m2 (98c) / (4) = 21.6306 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 89.0000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	600.6789	453.6378	352.6714	178.4938	63.9082	0.0000	0.0000	0.0000	0.0000	194.3271	419.3683	630.4364	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	674.9201	509.7054	396.2600	200.5548	71.8070	0.0000	0.0000	0.0000	0.0000	218.3450	471.2003	708.3556	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.6002	88.5520	88.4455	88.2325	87.8327	87.3000	87.3000	87.3000	87.3000	88.2645	88.5284	88.6186	(217)
Fuel for water heating, kWh/month													
	204.4696	179.7918	189.3132	163.3131	156.3864	138.9763	135.5870	142.8443	146.3923	164.6837	178.3712	201.8237	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6991	-44.1757	-67.0999	-79.8758	-90.0131	-85.5051	-84.4585	-77.7704	-66.6211	-52.3995	-33.4555	-25.4097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8710	-23.5240	-48.2006	-74.6496	-100.8899	-102.1830	-100.7492	-84.0465	-60.1140	-34.1457	-14.6664	-8.5406	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 3251.1482 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 87.3000
Water heating fuel used 2001.9527 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)
mechanical ventilation fans (SFP = 0.1950) 81.9360 (230a)
central heating pump 41.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 167.9360 (231)
Electricity for lighting (calculated in Appendix L) 242.3764 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -1399.0639 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (235)
Appendix Q - special features
Energy saved or generated -0.0000 (236)
Energy used 0.0000 (237)
Total delivered energy for all uses 4485.7475 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3251.1482	3.6400	118.3418	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2001.9527	3.6400	72.8711	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	16.4900	-121.4461	
PV Unit electricity exported	-662.5806	5.5900	-37.0383	
Total			-158.4844	(252)
Total energy cost			228.8976	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.4609 (257)

SAP value	92.5281	
SAP rating (Section 12)	93	(258)
SAP band	A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3251.1482	0.2100	682.7411	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2001.9527	0.2100	420.4101	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1103.1512	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	0.1334	-98.2728	
PV Unit electricity exported	-662.5806	0.1251	-82.8740	
Total			-181.1468	(269)
Total CO2, kg/year			1011.0830	(272)
CO2 emissions per m2			7.5600	(273)
EI value			92.4213	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.6800	(17)
Infiltration rate		0.1340	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1139	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1224	0.1167	0.1167	0.1082	0.1111	0.0968	0.0968	0.0940	0.0968	0.1082	0.1054	0.1139	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.1000	3.2200	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	50.5271		(33)
Main dwelling						
Party Wall 1	150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1	70.0800			9.0000	630.7200	(32c)
Internal Wall 2	86.3900			9.0000	777.5100	(32c)
Internal Wall 3	76.6200			9.0000	689.5800	(32c)
Internal Floor 1	43.2700			18.0000	778.8600	(32d)
Internal Floor 2	43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1	47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2	43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		19788.5781	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					147.9299	(35)
List of Thermal Bridges						
K1 Element				Length	Psi-value	Total
E2 Other lintels (including other steel lintels)				11.9300	0.0500	0.5965
E3 Sill				8.3000	0.0170	0.1411
E4 Jamb				45.3100	0.0130	0.5890
E5 Ground floor (normal)				9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling				18.9500	0.0030	0.0568
E18 Party wall between dwellings				30.9600	0.0400	1.2384
P1 Party wall - Ground floor				19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling				36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)				19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)				2.4700	0.0039	0.0096
E15 Flat roof with parapet				6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)				7.1200	0.0400	0.2848
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						5.9862 (36)
Point Thermal bridges					(36a) =	0.0000
Total fabric heat loss				(33) + (36) + (36a) =		56.5133 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	113.3416	(39)
Average = Sum(39)m / 12 =												113.3416	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	0.8473	(40)
HLP (average)												0.8473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy					2.9041	(42)
Hot water usage for mixer showers						
48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	(42a)
40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	
Hot water usage for baths						
31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	(42b)
26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	
Hot water usage for other uses						
44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	(42c)
36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	
Average daily hot water use (litres/day)					114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month													
	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month													
	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)	
Water heating gains (Table 5)													
	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains													
	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	873.0506	973.1863	1093.5629	1234.2992	1311.3327	1335.9490	1265.4193	1174.0231	1060.8660	932.9823	847.6017	826.3379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	48.4979	
alpha	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	4.2332	
util living area													
	0.9755	0.9600	0.9185	0.8166	0.6452	0.4333	0.2944	0.3263	0.6022	0.8620	0.9567	0.9797	(86)
MIT	19.7756	19.9697	20.3083	20.6777	20.9072	20.9865	20.9980	20.9970	20.9470	20.6490	20.1466	19.7214	(87)
Th 2	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	20.2125	(88)
util rest of house													
	0.9709	0.9527	0.9039	0.7862	0.5954	0.3707	0.2247	0.2517	0.5352	0.8312	0.9473	0.9758	(89)
MIT 2	18.7823	19.0262	19.4460	19.8846	20.1331	20.2044	20.2119	20.2115	20.1744	19.8620	19.2518	18.7141	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.9783	19.2123	19.6161	20.0411	20.2858	20.3587	20.3670	20.3664	20.3268	20.0173	19.4283	18.9128	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8283	19.0623	19.4661	19.8911	20.1358	20.2087	20.2170	20.2164	20.1768	19.8673	19.2783	18.7628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9600	0.9390	0.8873	0.7725	0.5903	0.3704	0.2251	0.2520	0.5320	0.8155	0.9330	0.9661	(94)
Useful gains	838.1636	913.8289	970.2727	953.5526	774.0377	494.7941	284.8741	295.8957	564.3697	760.8158	790.8307	798.3001	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1555.9853	1514.5071	1367.5941	1132.4066	820.1153	499.6901	285.2776	296.5508	586.7522	948.3631	1278.3055	1548.5685	(97)
Space heating kWh	534.0593	403.6557	295.6072	128.7749	34.2817	0.0000	0.0000	0.0000	0.0000	139.5352	350.9818	558.1997	(98a)
Space heating requirement - total per year (kWh/year)												2445.0956	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	534.0593	403.6557	295.6072	128.7749	34.2817	0.0000	0.0000	0.0000	0.0000	139.5352	350.9818	558.1997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2445.0956	
Space heating per m2											(98c) / (4) =	18.2784	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	534.0593	403.6557	295.6072	128.7749	34.2817	0.0000	0.0000	0.0000	0.0000	139.5352	350.9818	558.1997	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	600.0667	453.5458	332.1429	144.6909	38.5188	0.0000	0.0000	0.0000	0.0000	156.7811	394.3616	627.1907	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.5632	88.5125	88.3777	88.0941	87.6343	87.3000	87.3000	87.3000	87.3000	88.1244	88.4654	88.5814	(217)
Fuel for water heating, kWh/month	204.5552	179.8721	189.4586	163.5697	156.7404	138.9763	135.5870	142.8443	146.3923	164.9454	178.4983	201.9085	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.4253	-45.6931	-68.9270	-82.7482	-91.6053	-89.9100	-88.2926	-82.6756	-71.2664	-57.0077	-38.1399	-29.6511	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.0123	-25.0045	-50.7526	-80.2991	-104.8371	-114.4767	-111.3649	-96.0353	-69.0375	-40.0397	-18.4745	-11.1058	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2747.2984	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2003.3481	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1515.7821	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3866.5748	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2747.2984	7.3200	201.1022	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.3481	7.3200	146.6451	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	27.6700	-215.9207	
PV Unit electricity exported	-735.4399	5.8100	-42.7291	
Total			-258.6498	(252)
Total energy cost			371.8918	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2747.2984	0.2100	576.9327	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2003.3481	0.2100	420.7031	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			997.6358	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	0.1336	-104.2821	
PV Unit electricity exported	-735.4399	0.1250	-91.9297	
Total			-196.2118	(269)
Total CO2, kg/year			890.5025	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2747.2984	1.1300	3104.4472	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.3481	1.1300	2263.7833	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			5368.2305	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	1.4938	-1165.6983	
PV Unit electricity exported	-735.4399	0.4587	-337.3578	
Total			-1503.0562	(283)
Total Primary energy kWh/year			4826.2636	(286)

Summary for Input Data

Plot Reference	Plot 59	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	20 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.81	**TER**	9.21
Environmental	92 A	**% DER < TER**			15.20
CO_2 Emissions (t/year)	0.88	**DFEE**	28.54	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			11.45
% DPER < TPER	11.60	**DPER**	42.43	**TPER**	48.00

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, Mid-Terrace	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	147.93	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	9.47 m	47.23 m²	2.40 m
1st Storey:	9.47 m	43.27 m²	2.67 m
2nd Storey:	9.47 m	43.27 m²	2.67 m

8.0 Living Area	26.39	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.25	60.00	73.30	49.03	0.00	None	24.27	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	150.34	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	70.08
Internal Wall 2	Plasterboard on timber frame	9.00	86.39
Internal Wall 3	Plasterboard on timber frame	9.00	76.62

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof-500mm	External Plane Roof	Plasterboard, insulated at ceiling level	0.08	9.00	32.20	32.20	None	0.00	Enter Gross Area	0.00
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.91	3.91	None	0.00	Enter Gross Area	0.00
Sloping	External Slope Roof	Plasterboard, insulated slope	0.14	9.00	10.21	10.21	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.23
Internal Ceiling 2	+2	Plasterboard ceiling, carpeted chipboard floor	9.00	43.27

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground FLoor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	47.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27
Internal Floor 2	+2	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.20
Patio Door	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Front Door	Brickwork	South East	2.15	
Patio Door	Patio Door	Brickwork	North West	5.85	
NW	Window	Brickwork	North West	7.16	
SE	Window	Brickwork	South East	9.12	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging — Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	11.93	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.30	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	45.31	0.01	0.01	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	9.47	0.07	0.07	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	18.95	0.00	0.00	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	30.96	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	19.94	0.06	0.06	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	36.54	0.00	0.00		No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	19.94	0.04	0.04	RCD	No
E13 Gable (insulation at rafter level)	Non Gov Approved Schemes	2.47	0.00	0.00	RCD	No
E15 Flat roof with parapet	Independently assessed	6.41	0.09	0.09	AbbeyCalculated	No
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	7.12	0.04	0.04	RCD	No

Y-value: 0.04 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500755
Duct Type	Rigid
Wet Rooms	5

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	1
0.15	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0
0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.88	m³/(h.m²) @ 50 Pa
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
PD	106.00	8.00	848.00	12
DL	106.00	8.00	848.00	26

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18123	
Fuel Type	Mains gas	
In Winter	89.00	
In Summer	87.30	
Model Name	LOGIC CODE COMBI ESP1	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	Standard Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	
28.0 Water Heating		
Water Heating	Main Heating 1	

Summary for Input Data

SAP Code	901
Flue Gas Heat Recovery System	Yes
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1
Ensuite 2	Instantaneous electric shower		9.30	No	

28.2 Flue Gas Heat Recovery System

Database ID	0
Brand Model	
Details	

28.3 Waste Water Heat Recovery System

Instantaneous System 1

Database ID	80116
Brand Model	Showersave, QB1-21
Details	Year: 2017 + current Efficiency: 69.85 Utilisation factor: 0.973

29.0 Hot Water Cylinder None

32.0 Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
1.62	South	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	Plot 59	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	20 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.81	**TER**	9.21
Environmental	92 A	**% DER < TER**			15.20
CO_2 Emissions (t/year)	0.88	**DFEE**	28.54	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			11.45
% DPER < TPER	11.60	**DPER**	42.43	**TPER**	48.00

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8800	(17)
Infiltration rate		0.1440	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.8831			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200		9.0000	689.5800 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.8693 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	(39)

Average = Sum(39)m / 12 = 112.6976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	(40)
HLP (average)												0.8425	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892

Distribution loss (46)m = 0.15 x (45)m

29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)

Total heat required for water heating calculated for each month

202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS -21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)

Total per year (kWh/year) = Sum(64)m = 1763.5798 (64)
12Total per year (kWh/year) 1764 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	626.2393	643.8310	614.4600	593.2546	560.7645	536.8373	514.5467	514.6767	531.6441	553.1095	588.8766	611.6974	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	773.6520	909.8304	1017.9920	1159.5924	1255.6640	1253.3473	1194.2543	1094.3994	990.9142	857.7673	768.1567	736.0960	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	
alpha	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	
util living area	0.9864	0.9728	0.9450	0.8689	0.7303	0.5508	0.4094	0.4631	0.7010	0.9118	0.9748	0.9889	(86)
MIT	19.5567	19.8012	20.1330	20.5407	20.8309	20.9601	20.9910	20.9850	20.8930	20.4969	19.9452	19.4967	(87)
Th 2	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	(88)
util rest of house	0.9839	0.9678	0.9349	0.8460	0.6884	0.4910	0.3390	0.3885	0.6425	0.8909	0.9693	0.9868	(89)
MIT 2	18.5075	18.8170	19.2333	19.7295	20.0587	20.1875	20.2121	20.2085	20.1295	19.6877	19.0023	18.4312	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.7145	19.0111	19.4108	19.8895	20.2110	20.3399	20.3657	20.3617	20.2801	19.8473	19.1883	18.6414	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5645	18.8611	19.2608	19.7395	20.0610	20.1899	20.2157	20.2117	20.1301	19.6973	19.0383	18.4914	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9763	0.9565	0.9197	0.8301	0.6795	0.4888	0.3389	0.3880	0.6355	0.8742	0.9582	0.9802	(94)
Useful gains	755.3502	870.2192	936.2198	962.5228	853.1672	612.6815	404.6980	424.6335	629.7470	749.8177	736.0510	721.5389	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1607.5704	1573.3874	1438.1130	1221.5873	942.2693	629.9667	407.4837	429.5650	679.5786	1025.2471	1345.4205	1610.6096	(97)
Space heating kWh	634.0519	472.5290	373.4085	186.5265	66.2919	0.0000	0.0000	0.0000	0.0000	204.9195	438.7460	661.4686	(98a)
Space heating requirement - total per year (kWh/year)												3037.9420	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	634.0519	472.5290	373.4085	186.5265	66.2919	0.0000	0.0000	0.0000	0.0000	204.9195	438.7460	661.4686	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3037.9420	
Space heating per m2										(98c) / (4) =		22.7102	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	634.0519	472.5290	373.4085	186.5265	66.2919	0.0000	0.0000	0.0000	0.0000	204.9195	438.7460	661.4686	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	712.4178	530.9315	419.5602	209.5803	74.4853	0.0000	0.0000	0.0000	0.0000	230.2466	492.9730	743.2232	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.6165	88.5654	88.4667	88.2510	87.8462	87.3000	87.3000	87.3000	87.3000	88.2866	88.5437	88.6327	(217)
Fuel for water heating, kWh/month	204.4320	179.7647	189.2680	163.2789	156.3624	138.9763	135.5870	142.8443	146.3923	164.6425	178.3406	201.7918	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6991	-44.1757	-67.0999	-79.8758	-90.0131	-85.5051	-84.4585	-77.7704	-66.6211	-52.3995	-33.4555	-25.4097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8710	-23.5240	-48.2006	-74.6496	-100.8899	-102.1830	-100.7492	-84.0465	-60.1140	-34.1457	-14.6664	-8.5406	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3413.4180	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2001.6808	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1399.0639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4647.7454	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3413.4180	0.2100	716.8178	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2001.6808	0.2100	420.3530	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1137.1707	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	0.1334	-98.2728	
PV Unit electricity exported	-662.5806	0.1251	-82.8740	
Total			-181.1468	(269)
Total CO2, kg/year			1045.1026	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.8100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3413.4180	1.1300	3857.1623	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2001.6808	1.1300	2261.8993	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6119.0616	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	1.4931	-1099.6344	
PV Unit electricity exported	-662.5806	0.4591	-304.1784	
Total			-1403.8128	(283)
Total Primary energy kWh/year			5676.3381	(286)
Dwelling Primary energy Rate (DPER)			42.4300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3661	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.0546	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9858	0.9734	0.9491	0.8821	0.7574	0.5808	0.4368	0.4905	0.7261	0.9182	0.9747	0.9881	(86)
MIT	19.3267	19.5811	19.9398	20.4095	20.7577	20.9376	20.9842	20.9754	20.8487	20.3847	19.7818	19.2898	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9831	0.9684	0.9392	0.8596	0.7141	0.5151	0.3565	0.4067	0.6647	0.8975	0.9690	0.9858	(89)
MIT 2	18.1517	18.4755	18.9281	19.5109	19.9128	20.1029	20.1405	20.1368	20.0217	19.4939	18.7399	18.1104	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9573	0.9249	0.8461	0.7109	0.5247	0.3717	0.4222	0.6678	0.8838	0.9584	0.9790	(94)
Useful gains	779.8988	895.5847	964.6773	1000.6973	908.3651	668.6617	451.4744	470.7475	675.9424	777.9455	759.4567	745.8018	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1793.9332	1752.2154	1599.8074	1349.4991	1045.6941	699.3647	457.4319	480.5183	754.1209	1131.8210	1485.3829	1782.4521	(97)
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98a)
Space heating requirement - total per year (kWh/year)												3713.1625	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3713.1625	
Space heating per m2											(98c) / (4) =	27.7578	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	816.4952	623.0042	511.4035	271.7936	110.5766	0.0000	0.0000	0.0000	0.0000	284.9388	565.6568	834.7055	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.5701	86.3118	85.8221	84.7688	82.9827	80.3000	80.3000	80.3000	80.3000	84.8433	86.1226	86.6251	(217)
Fuel for water heating, kWh/month													
	292.5137	259.3615	277.2051	247.3844	245.3111	228.8498	226.3471	235.2227	237.6393	250.2827	261.4890	289.2525	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4018.5742	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3050.8589	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	264.9585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5085.9305	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4018.5742	0.2100	843.9006	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3050.8589	0.2100	640.6804	(264)
Space and water heating			1484.5810	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1232.5839	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4018.5742	1.1300	4540.9888	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3050.8589	1.1300	3447.4706	(278)
Space and water heating			7988.4594	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			6421.2881	(286)
Target Primary Energy Rate (TPER)			48.0000	(287)

Full SAP Calculation Printout

Plot Reference	Plot 59	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	20 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.81	**TER**	9.21
Environmental	92 A	**% DER < TER**			15.20
CO_2 Emissions (t/year)	0.88	**DFEE**	28.54	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			11.45
% DPER < TPER	11.60	**DPER**	42.43	**TPER**	48.00

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8800	(17)
Infiltration rate		0.2601	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2211	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2819	0.2764	0.2709	0.2432	0.2377	0.2101	0.2101	0.2045	0.2211	0.2377	0.2488	0.2598	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5397	0.5382	0.5367	0.5296	0.5283	0.5221	0.5221	0.5209	0.5244	0.5283	0.5309	0.5338	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.8831			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)

Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.8693 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.3451	61.1697	60.9978	60.1903	60.0392	59.3359	59.3359	59.2057	59.6068	60.0392	60.3449	60.6644	(38)
Heat transfer coeff	117.2144	117.0391	116.8671	116.0596	115.9085	115.2052	115.2052	115.0750	115.4761	115.9085	116.2142	116.5337	(39)
Average = Sum(39)m / 12 =												116.0589	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8762	0.8749	0.8736	0.8676	0.8665	0.8612	0.8612	0.8602	0.8632	0.8665	0.8688	0.8711	(40)
HLP (average)												0.8676	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
								Total per year (kWh/year) = Sum(64)m =			981.4310	(64)
12Total per year (kWh/year)											981	(64)

Electric shower(s)

58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							664.1943	(64a)

Heat gains from water heating, kWh/month

40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Northwest			5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)				
Southeast			9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)				
Northwest			7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)				
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8955	46.9658	47.0348	47.3621	47.4238	47.7133	47.7133	47.7674	47.6014	47.4238	47.2991	47.1694	
alpha	4.1264	4.1311	4.1357	4.1575	4.1616	4.1809	4.1809	4.1845	4.1734	4.1616	4.1533	4.1446	
util living area	0.9893	0.9779	0.9540	0.8843	0.7524	0.5702	0.4256	0.4817	0.7236	0.9246	0.9796	0.9913	(86)
MIT	19.4198	19.6736	20.0241	20.4738	20.7977	20.9517	20.9887	20.9814	20.8721	20.4309	19.8452	19.3723	(87)
Th 2	20.1877	20.1889	20.1900	20.1951	20.1961	20.2006	20.2006	20.2014	20.1989	20.1961	20.1941	20.1921	(88)
util rest of house	0.9873	0.9737	0.9452	0.8629	0.7107	0.5082	0.3514	0.4035	0.6647	0.9058	0.9750	0.9896	(89)
MIT 2	18.7272	18.9791	19.3240	19.7577	20.0479	20.1729	20.1961	20.1935	20.1170	19.7265	19.1550	18.6833	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.8639	19.1161	19.4621	19.8990	20.1958	20.3265	20.3524	20.3489	20.2659	19.8655	19.2912	18.8192	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8639	19.1161	19.4621	19.8990	20.1958	20.3265	20.3524	20.3489	20.2659	19.8655	19.2912	18.8192	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9666	0.9355	0.8539	0.7107	0.5183	0.3657	0.4182	0.6700	0.8966	0.9684	0.9857	(94)
Useful gains	715.5514	836.5036	913.0694	959.2467	869.0426	635.9949	428.0392	447.0442	645.4963	738.0731	705.0874	681.4612	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1707.0942	1663.8391	1514.8489	1276.5351	984.7355	659.7259	432.3012	454.4196	712.0192	1073.9463	1416.7847	1703.6344	(97)
Space heating kWh	737.7079	555.9694	447.7239	228.4476	86.0755	0.0000	0.0000	0.0000	0.0000	249.8897	512.4221	760.4969	(98a)
Space heating requirement - total per year (kWh/year)												3578.7329	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	737.7079	555.9694	447.7239	228.4476	86.0755	0.0000	0.0000	0.0000	0.0000	249.8897	512.4221	760.4969	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3578.7329	
Space heating per m2											(98c) / (4) =	26.7529	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1082.9291	852.5187	874.5699	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8873	0.9336	0.9073	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	960.8650	795.9080	793.4878	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	289.8328	375.2736	291.1557	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	72.4582	93.8184	72.7889	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												239.0655	(107)
Energy for space heating												26.7529	(99)
Energy for space cooling												1.7871	(108)
Total												28.5400	(109)
Fabric Energy Efficiency (DFEE)												28.5	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.0546	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	69.5228	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	

Distribution loss (46)m = 0.15 x (45)m

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
										Total per year (kWh/year) = Sum(64)m =		981.4310	(64)
12Total per year (kWh/year)												981	(64)
Electric shower(s)													
	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		664.1943	(64a)
Heat gains from water heating, kWh/month													
	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains													
	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	728.1197	865.4130	976.0170	1123.3591	1222.8406	1227.1135	1170.4117	1068.8760	963.3752	823.2264	728.1286	691.3338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9896	0.9793	0.9581	0.8963	0.7761	0.5987	0.4518	0.5091	0.7481	0.9319	0.9808	0.9915	(86)
MIT	19.2421	19.5020	19.8713	20.3636	20.7342	20.9305	20.9822	20.9719	20.8308	20.3331	19.7087	19.2054	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9876	0.9752	0.9497	0.8756	0.7340	0.5322	0.3694	0.4232	0.6879	0.9138	0.9763	0.9898	(89)
MIT 2	18.5031	18.7621	19.1270	19.6076	19.9441	20.1086	20.1414	20.1381	20.0362	19.5890	18.9765	18.4729	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6489	18.9081	19.2738	19.7567	20.1000	20.2708	20.3073	20.3026	20.1930	19.7358	19.1209	18.6174	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6489	18.9081	19.2738	19.7567	20.1000	20.2708	20.3073	20.3026	20.1930	19.7358	19.1209	18.6174	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9828	0.9678	0.9395	0.8650	0.7319	0.5422	0.3851	0.4391	0.6916	0.9035	0.9694	0.9857	(94)
Useful gains	715.6229	837.5678	916.9247	971.7452	895.0082	665.3041	450.7186	469.3420	666.3008	743.8142	705.8243	681.4346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1827.7387	1779.4634	1618.3197	1358.0798	1048.2448	699.7643	457.4740	480.5706	755.1334	1140.0729	1507.3889	1817.0266	(97)
Space heating kWh													
	827.4142	632.9538	521.8379	278.1609	114.0080	0.0000	0.0000	0.0000	0.0000	294.8165	577.1265	844.8804	(98a)
Space heating requirement - total per year (kWh/year)												4091.1982	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	827.4142	632.9538	521.8379	278.1609	114.0080	0.0000	0.0000	0.0000	0.0000	294.8165	577.1265	844.8804	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4091.1982	
Space heating per m2											(98c) / (4) =	30.5838	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1159.9452	913.1484	935.8672	0.0000	0.0000	0.0000	0.0000	(100)

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8577	0.9115	0.8809	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	994.8804	832.3652	824.4242	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1363.4106	1300.3079	1184.8260	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	265.3417	348.1494	268.1389	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction										fC = cooled area / (4) =		1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	66.3354	87.0373	67.0347	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												220.4075 (107)
Energy for space heating												30.5838 (99)
Energy for space cooling												1.6477 (108)
Total												32.2315 (109)
Fabric Energy Efficiency (TFEE)												32.2 (109)

Full SAP Calculation Printout

Plot Reference	Plot 59	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	20 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.81	**TER**	9.21
Environmental	92 A	**% DER < TER**			15.20
CO_2 Emissions (t/year)	0.88	**DFEE**	28.54	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			11.45
% DPER < TPER	11.60	**DPER**	42.43	**TPER**	48.00

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8800	(17)
Infiltration rate		0.1440	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.8831			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200		9.0000	689.5800 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.8693 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	(39)

Average = Sum(39)m / 12 = 112.6976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	(40)
HLP (average)												0.8425	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892

Distribution loss (46)m = 0.15 x (45)m

29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)

Total heat required for water heating calculated for each month

202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS -21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)

Total per year (kWh/year) = Sum(64)m = 1763.5798 (64)
12Total per year (kWh/year) 1764 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	626.2393	643.8310	614.4600	593.2546	560.7645	536.8373	514.5467	514.6767	531.6441	553.1095	588.8766	611.6974	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	773.6520	909.8304	1017.9920	1159.5924	1255.6640	1253.3473	1194.2543	1094.3994	990.9142	857.7673	768.1567	736.0960	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	
alpha	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	
util living area	0.9864	0.9728	0.9450	0.8689	0.7303	0.5508	0.4094	0.4631	0.7010	0.9118	0.9748	0.9889	(86)
MIT	19.5567	19.8012	20.1330	20.5407	20.8309	20.9601	20.9910	20.9850	20.8930	20.4969	19.9452	19.4967	(87)
Th 2	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	(88)
util rest of house	0.9839	0.9678	0.9349	0.8460	0.6884	0.4910	0.3390	0.3885	0.6425	0.8909	0.9693	0.9868	(89)
MIT 2	18.5075	18.8170	19.2333	19.7295	20.0587	20.1875	20.2121	20.2085	20.1295	19.6877	19.0023	18.4312	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.7145	19.0111	19.4108	19.8895	20.2110	20.3399	20.3657	20.3617	20.2801	19.8473	19.1883	18.6414	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5645	18.8611	19.2608	19.7395	20.0610	20.1899	20.2157	20.2117	20.1301	19.6973	19.0383	18.4914	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9763	0.9565	0.9197	0.8301	0.6795	0.4888	0.3389	0.3880	0.6355	0.8742	0.9582	0.9802	(94)
Useful gains	755.3502	870.2192	936.2198	962.5228	853.1672	612.6815	404.6980	424.6335	629.7470	749.8177	736.0510	721.5389	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1607.5704	1573.3874	1438.1130	1221.5873	942.2693	629.9667	407.4837	429.5650	679.5786	1025.2471	1345.4205	1610.6096	(97)
Space heating kWh	634.0519	472.5290	373.4085	186.5265	66.2919	0.0000	0.0000	0.0000	0.0000	204.9195	438.7460	661.4686	(98a)
Space heating requirement - total per year (kWh/year)												3037.9420	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	634.0519	472.5290	373.4085	186.5265	66.2919	0.0000	0.0000	0.0000	0.0000	204.9195	438.7460	661.4686	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3037.9420	
Space heating per m2										(98c) / (4) =		22.7102	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	634.0519	472.5290	373.4085	186.5265	66.2919	0.0000	0.0000	0.0000	0.0000	204.9195	438.7460	661.4686	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	712.4178	530.9315	419.5602	209.5803	74.4853	0.0000	0.0000	0.0000	0.0000	230.2466	492.9730	743.2232	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.6165	88.5654	88.4667	88.2510	87.8462	87.3000	87.3000	87.3000	87.3000	88.2866	88.5437	88.6327	(217)
Fuel for water heating, kWh/month	204.4320	179.7647	189.2680	163.2789	156.3624	138.9763	135.5870	142.8443	146.3923	164.6425	178.3406	201.7918	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6991	-44.1757	-67.0999	-79.8758	-90.0131	-85.5051	-84.4585	-77.7704	-66.6211	-52.3995	-33.4555	-25.4097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8710	-23.5240	-48.2006	-74.6496	-100.8899	-102.1830	-100.7492	-84.0465	-60.1140	-34.1457	-14.6664	-8.5406	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3413.4180	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2001.6808	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1399.0639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4647.7454	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3413.4180	0.2100	716.8178	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2001.6808	0.2100	420.3530	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1137.1707	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	0.1334	-98.2728	
PV Unit electricity exported	-662.5806	0.1251	-82.8740	
Total			-181.1468	(269)
Total CO2, kg/year			1045.1026	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.8100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3413.4180	1.1300	3857.1623	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2001.6808	1.1300	2261.8993	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6119.0616	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	1.4931	-1099.6344	
PV Unit electricity exported	-662.5806	0.4591	-304.1784	
Total			-1403.8128	(283)
Total Primary energy kWh/year			5676.3381	(286)
Dwelling Primary energy Rate (DPER)			42.4300	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3661	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.1500	1.0000	2.1500			(26)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	73.2978	24.2800	49.0178	0.1800	8.8232			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.5480			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	9.4700	0.1600	1.5152
E6 Intermediate floor within a dwelling	18.9500	0.0000	0.0000
E18 Party wall between dwellings	30.9600	0.0600	1.8576
P1 Party wall - Ground floor	19.9400	0.0800	1.5952
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0800	1.5952
E13 Gable (insulation at rafter level)	2.4700	0.0800	0.1976
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.0546	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 61.6026	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	127.3787	127.0312	126.6906	125.0910	124.7917	123.3984	123.3984	123.1404	123.9351	124.7917	125.3971	126.0301	(39)
Average = Sum(39)m / 12 =												125.0895	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9522	0.9496	0.9471	0.9351	0.9329	0.9225	0.9225	0.9205	0.9265	0.9329	0.9374	0.9421	(40)
HLP (average)												0.9351	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	13.0100	11.2829	0.6300	0.7000	0.7700	44.8613	(81)

Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	799.6049	935.5398	1043.0074	1182.7867	1277.8192	1274.3934	1214.4796	1115.0853	1012.1712	880.2642	792.3851	761.7901	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.1534	43.2715	43.3878	43.9426	44.0480	44.5454	44.5454	44.6387	44.3525	44.0480	43.8353	43.6152	
alpha	3.8769	3.8848	3.8925	3.9295	3.9365	3.9697	3.9697	3.9759	3.9568	3.9365	3.9224	3.9077	
util living area													
	0.9858	0.9734	0.9491	0.8821	0.7574	0.5808	0.4368	0.4905	0.7261	0.9182	0.9747	0.9881	(86)
MIT	19.3267	19.5811	19.9398	20.4095	20.7577	20.9376	20.9842	20.9754	20.8487	20.3847	19.7818	19.2898	(87)
Th 2	20.1233	20.1255	20.1277	20.1378	20.1396	20.1484	20.1484	20.1501	20.1451	20.1396	20.1358	20.1318	(88)
util rest of house													
	0.9831	0.9684	0.9392	0.8596	0.7141	0.5151	0.3565	0.4067	0.6647	0.8975	0.9690	0.9858	(89)
MIT 2	18.1517	18.4755	18.9281	19.5109	19.9128	20.1029	20.1405	20.1368	20.0217	19.4939	18.7399	18.1104	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3835	18.6936	19.1277	19.6881	20.0795	20.2675	20.3070	20.3022	20.1848	19.6697	18.9454	18.3431	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9573	0.9249	0.8461	0.7109	0.5247	0.3717	0.4222	0.6678	0.8838	0.9584	0.9790	(94)
Useful gains	779.8988	895.5847	964.6773	1000.6973	908.3651	668.6617	451.4744	470.7475	675.9424	777.9455	759.4567	745.8018	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1793.9332	1752.2154	1599.8074	1349.4991	1045.6941	699.3647	457.4319	480.5183	754.1209	1131.8210	1485.3829	1782.4521	(97)
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98a)
Space heating requirement - total per year (kWh/year)												3713.1625	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3713.1625	
Space heating per m2											(98c) / (4) =	27.7578	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	754.4416	575.6559	472.5368	251.1373	102.1728	0.0000	0.0000	0.0000	0.0000	263.2834	522.6669	771.2679	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	816.4952	623.0042	511.4035	271.7936	110.5766	0.0000	0.0000	0.0000	0.0000	284.9388	565.6568	834.7055	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.5701	86.3118	85.8221	84.7688	82.9827	80.3000	80.3000	80.3000	80.3000	84.8433	86.1226	86.6251	(217)
Fuel for water heating, kWh/month													
	292.5137	259.3615	277.2051	247.3844	245.3111	228.8498	226.3471	235.2227	237.6393	250.2827	261.4890	289.2525	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4018.5742	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3050.8589	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	264.9585	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2334.4611	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5085.9305	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4018.5742	0.2100	843.9006	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3050.8589	0.2100	640.6804	(264)
Space and water heating			1484.5810	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1232.5839	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4018.5742	1.1300	4540.9888	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3050.8589	1.1300	3447.4706	(278)
Space and water heating			7988.4594	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			6421.2881	(286)
Target Primary Energy Rate (TPER)			48.0000	(287)

Full SAP Calculation Printout

Plot Reference	Plot 59	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 MT
Plot Address	20 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	7.81	**TER**	9.21
Environmental	92 A	**% DER < TER**			15.20
CO_2 Emissions (t/year)	0.88	**DFEE**	28.54	**TFEE**	32.23
Compliance Check	See BREL	**% DFEE < TFEE**			11.45
% DPER < TPER	11.60	**DPER**	42.43	**TPER**	48.00

Assessor Details	Miss Margarita Lucero Cuesta Lopez	**Assessor ID**	EG16-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8800	(17)
Infiltration rate		0.1440	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.8831			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	76.6200		9.0000	689.5800 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9299 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.8693 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	(39)
Average = Sum(39)m / 12 =												112.6976	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	(40)
HLP (average)												0.8425	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

		W/m2	or Table 6b	or Table 6c	Table 6d		
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	845.6576	962.6152	1078.1226	1200.1491	1286.2902	1266.6912	1207.2510	1109.6877	1010.5191	896.9461	817.2660	802.4876	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	
alpha	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	
util living area	0.9814	0.9671	0.9346	0.8574	0.7189	0.5458	0.4052	0.4572	0.6916	0.9003	0.9689	0.9849	(86)
MIT	19.6428	19.8604	20.1918	20.5684	20.8409	20.9614	20.9913	20.9857	20.8985	20.5297	20.0007	19.5772	(87)
Th 2	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	(88)
util rest of house	0.9780	0.9613	0.9230	0.8333	0.6767	0.4863	0.3354	0.3834	0.6329	0.8776	0.9623	0.9821	(89)
MIT 2	18.6165	18.8911	19.3051	19.7611	20.0688	20.1885	20.2122	20.2089	20.1343	19.7256	19.0717	18.5334	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.8189	19.0823	19.4800	19.9204	20.2211	20.3410	20.3659	20.3621	20.2850	19.8843	19.2550	18.7393	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6689	18.9323	19.3300	19.7704	20.0711	20.1910	20.2159	20.2121	20.1350	19.7343	19.1050	18.5893	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9688	0.9488	0.9071	0.8178	0.6683	0.4843	0.3353	0.3829	0.6263	0.8609	0.9500	0.9740	(94)
Useful gains	819.2699	913.3427	977.9469	981.4919	859.6566	613.4001	404.8325	424.9267	632.9291	772.1466	776.4196	781.6027	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1619.3445	1581.4086	1445.9142	1225.0656	943.4014	630.0895	407.5080	429.6173	680.1356	1029.4094	1352.9306	1621.6375	(97)
Space heating kWh	595.2554	448.9403	348.1677	175.3730	62.3061	0.0000	0.0000	0.0000	0.0000	191.4036	415.0879	624.9859	(98a)
Space heating requirement - total per year (kWh/year)												2861.5199	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	595.2554	448.9403	348.1677	175.3730	62.3061	0.0000	0.0000	0.0000	0.0000	191.4036	415.0879	624.9859	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2861.5199	
Space heating per m2											(98c) / (4) =	21.3913	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	595.2554	448.9403	348.1677	175.3730	62.3061	0.0000	0.0000	0.0000	0.0000	191.4036	415.0879	624.9859	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	668.8263	504.4273	391.1996	197.0483	70.0069	0.0000	0.0000	0.0000	0.0000	215.0602	466.3909	702.2313	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.5974	88.5486	88.4407	88.2251	87.8235	87.3000	87.3000	87.3000	87.3000	88.2582	88.5249	88.6160	(217)
Fuel for water heating, kWh/month	204.4760	179.7988	189.3235	163.3268	156.4028	138.9763	135.5870	142.8443	146.3923	164.6955	178.3783	201.8296	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6991	-44.1757	-67.0999	-79.8758	-90.0131	-85.5051	-84.4585	-77.7704	-66.6211	-52.3995	-33.4555	-25.4097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8710	-23.5240	-48.2006	-74.6496	-100.8899	-102.1830	-100.7492	-84.0465	-60.1140	-34.1457	-14.6664	-8.5406	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3215.1909	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	87.3000	
Water heating fuel used	2002.0313	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1399.0639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4449.8688	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3215.1909	3.6400	117.0329	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2002.0313	3.6400	72.8739	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	16.4900	-121.4461	
PV Unit electricity exported	-662.5806	5.5900	-37.0383	
Total			-158.4844	(252)
Total energy cost			227.5916	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4583	(257)
SAP value		92.5707	
SAP rating (Section 12)		93	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3215.1909	0.2100	675.1901	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2002.0313	0.2100	420.4266	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1095.6167	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	0.1334	-98.2728	
PV Unit electricity exported	-662.5806	0.1251	-82.8740	
Total			-181.1468	(269)
Total CO2, kg/year			1003.5485	(272)
CO2 emissions per m2			7.5000	(273)
EI value			92.4777	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)			Volume (m3)	
Main dwelling							
Ground floor	47.2300	(1b)	x 2.4000	(2b)	=	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	344.4138	(5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8800 (17)
Infiltration rate		0.1440 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1316	0.1255	0.1255	0.1163	0.1193	0.1040	0.1040	0.1010	0.1040	0.1163	0.1132	0.1224	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.8831			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	147.9299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.9862 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 55.8693 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	(39)
Average = Sum(39)m / 12 =												112.6976	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	(40)
HLP (average)												0.8425	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)

Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month													
	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month													
	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains													
	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	873.0506	973.1863	1093.5629	1234.2992	1311.3327	1335.9490	1265.4193	1174.0231	1060.8660	932.9823	847.6017	826.3379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	
alpha	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	
util living area													
	0.9753	0.9597	0.9178	0.8150	0.6428	0.4312	0.2928	0.3245	0.5998	0.8608	0.9564	0.9796	(86)
MIT	19.7869	19.9806	20.3177	20.6839	20.9098	20.9871	20.9981	20.9971	20.9486	20.6549	20.1558	19.7327	(87)
Th 2	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	(88)
util rest of house													
	0.9707	0.9524	0.9031	0.7846	0.5932	0.3690	0.2238	0.2507	0.5331	0.8299	0.9470	0.9757	(89)
MIT 2	18.7995	19.0428	19.4606	19.8952	20.1394	20.2089	20.2160	20.2156	20.1797	19.8722	19.2664	18.7313	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.9943	19.2278	19.6297	20.0508	20.2914	20.3624	20.3703	20.3698	20.3314	20.0266	19.4418	18.9289	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8443	19.0778	19.4797	19.9008	20.1414	20.2124	20.2203	20.2198	20.1814	19.8766	19.2918	18.7789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9599	0.9387	0.8866	0.7711	0.5882	0.3687	0.2242	0.2510	0.5300	0.8143	0.9327	0.9660	(94)
Useful gains	838.0437	913.5526	969.5382	951.7690	771.3540	492.5660	283.6515	294.6223	562.2548	759.7429	790.5593	798.2184	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1548.9543	1507.6499	1361.3485	1127.0688	816.0912	497.2650	284.0356	295.2472	583.9326	944.0247	1272.5615	1541.5765	(97)
Space heating kWh													
	528.9175	399.2334	291.5069	126.2159	33.2845	0.0000	0.0000	0.0000	0.0000	137.1057	347.0416	553.0584	(98a)
Space heating requirement - total per year (kWh/year)												2416.3638	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	528.9175	399.2334	291.5069	126.2159	33.2845	0.0000	0.0000	0.0000	0.0000	137.1057	347.0416	553.0584	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2416.3638	
Space heating per m2											(98c) / (4) =	18.0636	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	528.9175	399.2334	291.5069	126.2159	33.2845	0.0000	0.0000	0.0000	0.0000	137.1057	347.0416	553.0584	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	594.2894	448.5768	327.5358	141.8156	37.3983	0.0000	0.0000	0.0000	0.0000	154.0513	389.9344	621.4140	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.5600	88.5086	88.3722	88.0856	87.6265	87.3000	87.3000	87.3000	87.3000	88.1170	88.4613	88.5785	(217)
Fuel for water heating, kWh/month													
	204.5624	179.8799	189.4704	163.5855	156.7545	138.9763	135.5870	142.8443	146.3923	164.9594	178.5066	201.9151	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.4253	-45.6931	-68.9270	-82.7482	-91.6053	-89.9100	-88.2926	-82.6756	-71.2664	-57.0077	-38.1399	-29.6511	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.0123	-25.0045	-50.7526	-80.2991	-104.8371	-114.4767	-111.3649	-96.0353	-69.0375	-40.0397	-18.4745	-11.1058	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2715.0155	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2003.4338	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)													
mechanical ventilation fans (SFP = 0.1950)												81.9360	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												167.9360	(231)
Electricity for lighting (calculated in Appendix L)												242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1515.7821	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3834.3776	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2715.0155	7.3200	198.7391	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.4338	7.3200	146.6514	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	27.6700	-215.9207	
PV Unit electricity exported	-735.4399	5.8100	-42.7291	
Total			-258.6498	(252)
Total energy cost			369.5350	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2715.0155	0.2100	570.1533	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2003.4338	0.2100	420.7211	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			990.8744	(265)

Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	0.1336	-104.2821	
PV Unit electricity exported	-735.4399	0.1250	-91.9297	
Total			-196.2118	(269)
Total CO2, kg/year			883.7411	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2715.0155	1.1300	3067.9675	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.4338	1.1300	2263.8802	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			5331.8477	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	1.4938	-1165.6983	
PV Unit electricity exported	-735.4399	0.4587	-337.3578	
Total			-1503.0562	(283)
Total Primary energy kWh/year			4789.8808	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: A 93
Current environmental impact rating: A 92

N Solar water heating	SAP increase too small
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.3	-£ 31	-138 kg (15.6%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 93
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£175	£175	£0
Mains gas	£453	£453	£0
Space heating	£353	£353	£0
Water heating	£208	£208	£0
Lighting	£67	£67	£0
Generated (PV)	-£259	-£259	£0
Total cost of fuels	£369	£369	£0
Total cost of uses	£369	£369	£0
Delivered energy	29 kWh/m²	29 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	7 kg/m²	7 kg/m²	0 kg/m²
Primary energy	36 kWh/m²	36 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8800	(17)
Infiltration rate		0.1440	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.8831			(33)
Main dwelling								
Party Wall 1			150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1			70.0800			9.0000	630.7200	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			76.6200			9.0000	689.5800	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19788.5781 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		147.9299 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.9862 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	55.8693 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	(39)
Average = Sum(39)m / 12 =												112.6976	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	(40)
HLP (average)												0.8425	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	11.2829	0.6300	0.7000	0.7700	20.1720	(81)
Southeast	9.1200	36.7938	0.6300	0.7000	0.7700	102.5514	(77)
Northwest	7.1600	11.2829	0.6300	0.7000	0.7700	24.6892	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	147.4127	265.9994	403.5320	566.3378	694.8995	716.5101	679.7076	579.7227	459.2701	304.6578	179.2800	124.3986	(83)
Total gains	845.6576	962.6152	1078.1226	1200.1491	1286.2902	1266.6912	1207.2510	1109.6877	1010.5191	896.9461	817.2660	802.4876	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	
alpha	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	
util living area	0.9814	0.9671	0.9346	0.8574	0.7189	0.5458	0.4052	0.4572	0.6916	0.9003	0.9689	0.9849	(86)
MIT	19.6428	19.8604	20.1918	20.5684	20.8409	20.9614	20.9913	20.9857	20.8985	20.5297	20.0007	19.5772	(87)
Th 2	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	(88)
util rest of house	0.9780	0.9613	0.9230	0.8333	0.6767	0.4863	0.3354	0.3834	0.6329	0.8776	0.9623	0.9821	(89)
MIT 2	18.6165	18.8911	19.3051	19.7611	20.0688	20.1885	20.2122	20.2089	20.1343	19.7256	19.0717	18.5334	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.8189	19.0823	19.4800	19.9204	20.2211	20.3410	20.3659	20.3621	20.2850	19.8843	19.2550	18.7393	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6689	18.9323	19.3300	19.7704	20.0711	20.1910	20.2159	20.2121	20.1350	19.7343	19.1050	18.5893	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9688	0.9488	0.9071	0.8178	0.6683	0.4843	0.3353	0.3829	0.6263	0.8609	0.9500	0.9740	(94)
Useful gains	819.2699	913.3427	977.9469	981.4919	859.6566	613.4001	404.8325	424.9267	632.9291	772.1466	776.4196	781.6027	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1619.3445	1581.4086	1445.9142	1225.0656	943.4014	630.0895	407.5080	429.6173	680.1356	1029.4094	1352.9306	1621.6375	(97)
Space heating kWh	595.2554	448.9403	348.1677	175.3730	62.3061	0.0000	0.0000	0.0000	0.0000	191.4036	415.0879	624.9859	(98a)
Space heating requirement - total per year (kWh/year)												2861.5199	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	

Space heating kWh

595.2554	448.9403	348.1677	175.3730	62.3061	0.0000	0.0000	0.0000	0.0000	191.4036	415.0879	624.9859	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 2861.5199

Space heating per m2 (98c) / (4) = 21.3913 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	595.2554	448.9403	348.1677	175.3730	62.3061	0.0000	0.0000	0.0000	0.0000	191.4036	415.0879	624.9859	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	668.8263	504.4273	391.1996	197.0483	70.0069	0.0000	0.0000	0.0000	0.0000	215.0602	466.3909	702.2313	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.5974	88.5486	88.4407	88.2251	87.8235	87.3000	87.3000	87.3000	87.3000	88.2582	88.5249	88.6160	(217)
Fuel for water heating, kWh/month													
	204.4760	179.7988	189.3235	163.3268	156.4028	138.9763	135.5870	142.8443	146.3923	164.6955	178.3783	201.8296	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6991	-44.1757	-67.0999	-79.8758	-90.0131	-85.5051	-84.4585	-77.7704	-66.6211	-52.3995	-33.4555	-25.4097	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-10.8710	-23.5240	-48.2006	-74.6496	-100.8899	-102.1830	-100.7492	-84.0465	-60.1140	-34.1457	-14.6664	-8.5406	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	3215.1909	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2002.0313	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1399.0639	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4449.8688	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3215.1909	3.6400	117.0329	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2002.0313	3.6400	72.8739	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	16.4900	-121.4461	
PV Unit electricity exported	-662.5806	5.5900	-37.0383	
Total			-158.4844	(252)
Total energy cost			227.5916	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.4583	(257)

SAP value	92.5707	
SAP rating (Section 12)	93	(258)
SAP band	A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3215.1909	0.2100	675.1901	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2002.0313	0.2100	420.4266	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1095.6167	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-736.4833	0.1334	-98.2728	
PV Unit electricity exported	-662.5806	0.1251	-82.8740	
Total			-181.1468	(269)
Total CO2, kg/year			1003.5485	(272)
CO2 emissions per m2			7.5000	(273)
EI value			92.4777	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		2.8800 (17)
Infiltration rate		0.1440 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1316	0.1255	0.1255	0.1163	0.1193	0.1040	0.1040	0.1010	0.1040	0.1163	0.1132	0.1224	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	73.2978	24.2800	49.0178	0.2500	12.2545	60.0000	2941.0683	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0800	2.5760	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping	10.2100		10.2100	0.1400	1.4294	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			166.8478					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	49.8831		(33)
Main dwelling						
Party Wall 1	150.3400	0.0000	0.0000	45.0000	6765.2998	(32)
Internal Wall 1	70.0800			9.0000	630.7200	(32c)
Internal Wall 2	86.3900			9.0000	777.5100	(32c)
Internal Wall 3	76.6200			9.0000	689.5800	(32c)
Internal Floor 1	43.2700			18.0000	778.8600	(32d)
Internal Floor 2	43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1	47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2	43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)		(28)...(30) + (32) + (32a)...(32e) =	19788.5781	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			147.9299	(35)
List of Thermal Bridges				

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3000	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	9.4700	0.0660	0.6250
E6 Intermediate floor within a dwelling	18.9500	0.0030	0.0568
E18 Party wall between dwellings	30.9600	0.0400	1.2384
P1 Party wall - Ground floor	19.9400	0.0580	1.1565
P2 Party wall - Intermediate floor within a dwelling	36.5400	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	19.9400	0.0360	0.7178
E13 Gable (insulation at rafter level)	2.4700	0.0039	0.0096
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.9862	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	55.8693	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	112.6976	(39)
Average = Sum(39)m / 12 =												112.6976	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	0.8425	(40)
HLP (average)												0.8425	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.9041	(42)
Hot water usage for mixer showers												
48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)
Hot water usage for baths												
31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses												
44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)
Average daily hot water use (litres/day)											114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	5.4537	4.9163	5.4232	5.2069	5.3541	5.1548	5.3102	5.3244	5.1687	5.3714	5.2378	5.4483	(61)
Total heat required for water heating calculated for each month													
	202.5648	178.1393	187.2616	160.5091	152.6555	134.4162	130.6370	137.7506	141.3438	161.3232	175.9968	199.8613	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
										Total per year (kWh/year) = Sum(64)m =		1763.5798	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month													
	71.7688	63.1613	66.5513	57.4576	54.9189	48.6586	47.5356	49.9654	51.0882	57.9311	62.7321	70.8703	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	96.4634	93.9900	89.4507	79.8022	73.8157	67.5814	63.8919	67.1579	70.9559	77.8644	87.1279	95.2558	(72)
Total internal gains													
	698.2449	696.6158	674.5906	633.8113	591.3906	550.1812	527.5434	529.9651	551.2490	592.2883	637.9860	678.0890	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.8500	13.7804	0.6300	0.7000	0.7700	24.6371	(81)
Southeast	9.1200	43.0593	0.6300	0.7000	0.7700	120.0144	(77)
Northwest	7.1600	13.7804	0.6300	0.7000	0.7700	30.1542	(81)

Solar gains	174.8057	276.5705	418.9723	600.4879	719.9421	785.7679	737.8759	644.0581	509.6170	340.6941	209.6158	148.2490	(83)
Total gains	873.0506	973.1863	1093.5629	1234.2992	1311.3327	1335.9490	1265.4193	1174.0231	1060.8660	932.9823	847.6017	826.3379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	48.7750	
alpha	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	4.2517	
util living area													
	0.9753	0.9597	0.9178	0.8150	0.6428	0.4312	0.2928	0.3245	0.5998	0.8608	0.9564	0.9796	(86)
MIT	19.7869	19.9806	20.3177	20.6839	20.9098	20.9871	20.9981	20.9971	20.9486	20.6549	20.1558	19.7327	(87)
Th 2	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	20.2167	(88)
util rest of house													
	0.9707	0.9524	0.9031	0.7846	0.5932	0.3690	0.2238	0.2507	0.5331	0.8299	0.9470	0.9757	(89)
MIT 2	18.7995	19.0428	19.4606	19.8952	20.1394	20.2089	20.2160	20.2156	20.1797	19.8722	19.2664	18.7313	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.9943	19.2278	19.6297	20.0508	20.2914	20.3624	20.3703	20.3698	20.3314	20.0266	19.4418	18.9289	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8443	19.0778	19.4797	19.9008	20.1414	20.2124	20.2203	20.2198	20.1814	19.8766	19.2918	18.7789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9599	0.9387	0.8866	0.7711	0.5882	0.3687	0.2242	0.2510	0.5300	0.8143	0.9327	0.9660	(94)
Useful gains	838.0437	913.5526	969.5382	951.7690	771.3540	492.5660	283.6515	294.6223	562.2548	759.7429	790.5593	798.2184	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1548.9543	1507.6499	1361.3485	1127.0688	816.0912	497.2650	284.0356	295.2472	583.9326	944.0247	1272.5615	1541.5765	(97)
Space heating kWh													
	528.9175	399.2334	291.5069	126.2159	33.2845	0.0000	0.0000	0.0000	0.0000	137.1057	347.0416	553.0584	(98a)
Space heating requirement - total per year (kWh/year)												2416.3638	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	528.9175	399.2334	291.5069	126.2159	33.2845	0.0000	0.0000	0.0000	0.0000	137.1057	347.0416	553.0584	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2416.3638	
Space heating per m2											(98c) / (4) =	18.0636	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	528.9175	399.2334	291.5069	126.2159	33.2845	0.0000	0.0000	0.0000	0.0000	137.1057	347.0416	553.0584	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	594.2894	448.5768	327.5358	141.8156	37.3983	0.0000	0.0000	0.0000	0.0000	154.0513	389.9344	621.4140	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.1606	159.2093	167.4391	144.0953	137.3584	121.3263	118.3674	124.7031	127.8005	145.3572	157.9093	178.8534	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.5600	88.5086	88.3722	88.0856	87.6265	87.3000	87.3000	87.3000	87.3000	88.1170	88.4613	88.5785	(217)
Fuel for water heating, kWh/month													
	204.5624	179.8799	189.4704	163.5855	156.7545	138.9763	135.5870	142.8443	146.3923	164.9594	178.5066	201.9151	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.4253	-45.6931	-68.9270	-82.7482	-91.6053	-89.9100	-88.2926	-82.6756	-71.2664	-57.0077	-38.1399	-29.6511	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.0123	-25.0045	-50.7526	-80.2991	-104.8371	-114.4767	-111.3649	-96.0353	-69.0375	-40.0397	-18.4745	-11.1058	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2715.0155	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2003.4338	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 8.7750, total flow = 45.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1515.7821	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3834.3776	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2715.0155	7.3200	198.7391	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.4338	7.3200	146.6514	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	27.6700	-215.9207	
PV Unit electricity exported	-735.4399	5.8100	-42.7291	
Total			-258.6498	(252)
Total energy cost			369.5350	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2715.0155	0.2100	570.1533	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2003.4338	0.2100	420.7211	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			990.8744	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	0.1336	-104.2821	
PV Unit electricity exported	-735.4399	0.1250	-91.9297	
Total			-196.2118	(269)
Total CO2, kg/year			883.7411	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2715.0155	1.1300	3067.9675	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2003.4338	1.1300	2263.8802	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			5331.8477	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-780.3423	1.4938	-1165.6983	
PV Unit electricity exported	-735.4399	0.4587	-337.3578	
Total			-1503.0562	(283)
Total Primary energy kWh/year			4789.8808	(286)

Summary for Input Data

elmhurst energy

Plot Reference	Plot 60	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 ET
Plot Address	22 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	8.96	**TER**	10.36
Environmental	91 B	**% DER < TER**			13.51
CO_2 Emissions (t/year)	1.01	**DFEE**	34.57	**TFEE**	37.68
Compliance Check	See BREL	**% DFEE < TFEE**			8.25
% DPER < TPER	11.23	**DPER**	48.11	**TPER**	54.19

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SUMMARY FOR INPUT DATA FOR: New Build (As Built)

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, End-Terrace	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	155.25	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	19.44 m	47.23 m²	2.40 m
1st Storey:	18.60 m	43.27 m²	2.67 m
2nd Storey:	18.60 m	43.27 m²	2.67 m

8.0 Living Area	26.39	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
Brickwork	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.25	60.00	145.98	121.71	0.00	None	24.27	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	75.19	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	76.62
Internal Wall 2	Plasterboard on timber frame	9.00	86.39
Internal Wall 3	Plasterboard on timber frame	9.00	70.08

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Cold Roof-500mm	External Plane Roof	Plasterboard, insulated at ceiling level	0.00	9.00	32.20	32.20	None	0.00	Enter Gross Area	0.00
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	3.91	3.91	None	0.00	Enter Gross Area	0.00
Sloping roof	External Slope Roof	Plasterboard, insulated slope	0.12	9.00	10.21	10.21	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

10.2 Internal Ceilings

Description	Storey	Construction	Kappa	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	9.00	47.23
Internal Ceiling 2	+2	Plasterboard ceiling, carpeted chipboard floor	9.00	43.27

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground FLoor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	47.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27
Internal Floor 2	+2	Plasterboard ceiling, carpeted chipboard floor	18.00	43.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.20
Patio Door	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Front Door	Brickwork	East	2.15	
Patio Door	Patio Door	Brickwork	West	5.85	
Rear	Window	Brickwork	West	7.16	
Front	Window	Brickwork	East	9.12	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	11.93	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.30	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	45.31	0.01	0.01	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.44	0.07	0.07	RCD	Yes
E6 Intermediate floor within a dwelling	Gov Approved Scheme	37.22	0.00	0.00	RCD	No
E16 Corner (normal)	Gov Approved Scheme	16.00	0.05	0.05	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	16.00	0.04	0.04	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.97	0.06	0.06	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	18.28	0.00	0.00		No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	9.97	0.04	0.04	RCD	No
E11 Eaves (insulation at rafter level)	Gov Approved Scheme	9.13	0.01	0.01	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.12	0.04	0.04	RCD	No
E15 Flat roof with parapet	Independently assessed	6.41	0.09	0.09	AbbeyCalculated	No
E13 Gable (insulation at rafter level)	Non Gov Approved Schemes	2.37	0.04	0.04	RCD	No

Y-value	0.03	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500755
Duct Type	Rigid
Wet Rooms	4

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	1
0.15	In Room Fan Other Wet Room	3
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0
0.14	Through Wall Fan Other Wet Room	0

Summary for Input Data

elmhurst energy

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	2.82	m³/(h.m²) @ 50 Pa

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
PD	106.00	8.00	848.00	12
DL	106.00	8.00	848.00	26

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	16636	
Fuel Type	Mains gas	
In Winter	88.30	
In Summer	87.30	
Model Name	Logic Code Combi	
Manufacturer	Ideal Boilers	
System Type	Combi boiler	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	Standard Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Summary for Input Data

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Above Bath	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1
Ensuite 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 2	Instantaneous electric shower		9.30	No	

28.3 Waste Water Heat Recovery System

Instantaneous System 1

Database ID	80116
Brand Model	Showersave, QB1-21
Details	Year: 2017 + current Efficiency: 69.85 Utilisation factor: 0.973

29.0 Hot Water Cylinder None

32.0 Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
2.43	South	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	Plot 60	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 ET
Plot Address	22 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	8.96	**TER**	10.36
Environmental	91 B	**% DER < TER**			13.51
CO_2 Emissions (t/year)	1.01	**DFEE**	34.57	**TFEE**	37.68
Compliance Check	See BREL	**% DFEE < TFEE**			8.25
% DPER < TPER	11.23	**DPER**	48.11	**TPER**	54.19

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8200	(17)
Infiltration rate		0.1410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1198	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1528	0.1498	0.1468	0.1318	0.1288	0.1139	0.1139	0.1109	0.1198	0.1288	0.1348	0.1408	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.2735			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0850 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 71.3585 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	(39)

Average = Sum(39)m / 12 = 128.1868

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	(40)
HLP (average)												0.9583	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892
Distribution loss (46)m = 0.15 x (45)m

29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

PV diverter
Solar input
FGHRS
Output from w/h

203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)

Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)
12Total per year (kWh/year) 2020 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.6460	651.2265	621.8349	600.5850	568.0674	544.1116	521.8038	521.9486	538.9333	560.4304	596.2403	619.0985	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.8500	19.6403	0.6300	0.7000	0.7700	35.1136	(80)
East	9.1200	19.6403	0.6300	0.7000	0.7700	54.7412	(76)
West	7.1600	19.6403	0.6300	0.7000	0.7700	42.9766	(80)

Solar gains	132.8313	259.8463	427.9298	624.1101	764.8704	782.9809	745.4298	640.3132	497.7001	308.3295	165.6251	109.2340 (83)
Total gains	766.4773	911.0728	1049.7647	1224.6951	1332.9377	1327.0925	1267.2336	1162.2618	1036.6334	868.7599	761.8653	728.3325 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	
alpha	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	
util living area	0.9894	0.9784	0.9530	0.8820	0.7531	0.5803	0.4352	0.4902	0.7321	0.9288	0.9806	0.9913	(86)
MIT	19.3353	19.5882	19.9665	20.4330	20.7732	20.9395	20.9849	20.9760	20.8488	20.3663	19.7540	19.2761	(87)
Th 2	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	(88)
util rest of house	0.9872	0.9741	0.9434	0.8586	0.7080	0.5120	0.3522	0.4032	0.6685	0.9094	0.9759	0.9895	(89)
MIT 2	18.1542	18.4752	18.9511	19.5211	19.9092	20.0752	20.1110	20.1058	19.9971	19.4537	18.6885	18.0788	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3873	18.6948	19.1514	19.7010	20.0796	20.2457	20.2834	20.2775	20.1651	19.6338	18.8987	18.3150	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2373	18.5448	19.0014	19.5510	19.9296	20.0957	20.1334	20.1275	20.0151	19.4838	18.7487	18.1650	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9804	0.9633	0.9278	0.8410	0.6975	0.5102	0.3537	0.4041	0.6603	0.8917	0.9656	0.9836	(94)
Useful gains	751.4351	877.6623	973.9495	1029.9315	929.7403	677.0811	448.1619	469.6849	684.5233	774.6808	735.6761	716.3638	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1786.5721	1749.0780	1602.5210	1365.3127	1054.9272	704.4773	452.9388	477.8164	758.2369	1138.7811	1493.2138	1790.1342	(97)
Space heating kWh	770.1420	585.5914	467.6572	241.4744	93.1391	0.0000	0.0000	0.0000	0.0000	270.8906	545.4271	798.8852	(98a)
Space heating requirement - total per year (kWh/year)												3773.2069	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	770.1420	585.5914	467.6572	241.4744	93.1391	0.0000	0.0000	0.0000	0.0000	270.8906	545.4271	798.8852	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3773.2069	
Space heating per m2											(98c) / (4) =	28.2067	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	770.1420	585.5914	467.6572	241.4744	93.1391	0.0000	0.0000	0.0000	0.0000	270.8906	545.4271	798.8852	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	872.1879	663.1839	529.6231	273.4705	105.4803	0.0000	0.0000	0.0000	0.0000	306.7844	617.6977	904.7398	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0893	88.0638	88.0094	87.8910	87.6666	87.3000	87.3000	87.3000	87.3000	87.9157	88.0507	88.0972	(217)
Fuel for water heating, kWh/month	230.6781	203.3625	215.1891	187.9677	181.4738	162.9741	160.3261	167.6338	170.4392	190.1188	203.4245	228.0196	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.4618	-60.0609	-88.8559	-102.9269	-113.5609	-107.0227	-105.7369	-98.5479	-86.1799	-70.0244	-46.1543	-35.6548	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.3933	-41.4888	-84.0948	-128.8611	-172.7937	-174.5094	-172.0747	-144.1775	-103.9228	-59.7933	-26.0286	-15.2705	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	4273.1675	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.6073	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2098.5959	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5107.8894	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4273.1675	0.2100	897.3652	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.6073	0.2100	483.3375	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1380.7027	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	0.1340	-128.1068	
PV Unit electricity exported	-1142.4085	0.1254	-143.2342	
Total			-271.3409	(269)
Total CO2, kg/year			1198.4404	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.9600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4273.1675	1.1300	4828.6793	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.6073	1.1300	2600.8162	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7429.4955	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	1.4951	-1429.6152	
PV Unit electricity exported	-1142.4085	0.4602	-525.7398	
Total			-1955.3550	(283)
Total Primary energy kWh/year			6435.2298	(286)
Dwelling Primary energy Rate (DPER)			48.1100	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.1161	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000	(17)
Infiltration rate												0.3661	(18)
Number of sides sheltered												2	(19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	155.2498	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E13 Gable (insulation at rafter level)	2.3700	0.0800	0.1896

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9543	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	75.5851	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff													
	141.3612	141.0137	140.6731	139.0735	138.7742	137.3809	137.3809	137.1229	137.9176	138.7742	139.3796	140.0126	(39)
Average = Sum(39)m / 12 =												139.0720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0567	1.0542	1.0516	1.0396	1.0374	1.0270	1.0270	1.0251	1.0310	1.0374	1.0419	1.0467	(40)
HLP (average)												1.0396	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m													
	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.1200	19.6403	0.6300	0.7000	0.7700	54.7412	(76)
West	13.0100	19.6403	0.6300	0.7000	0.7700	78.0902	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	132.8313	259.8463	427.9298	624.1101	764.8704	782.9809	745.4298	640.3132	497.7001	308.3295	165.6251	109.2340	(83)
Total gains	785.0236	929.3867	1067.4052	1240.5590	1347.7900	1340.8642	1280.2018	1175.6758	1050.6012	883.9359	778.7302	746.6255	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8091	40.9097	41.0087	41.4804	41.5699	41.9914	41.9914	42.0704	41.8280	41.5699	41.3893	41.2022	
alpha	3.7206	3.7273	3.7339	3.7654	3.7713	3.7994	3.7994	3.8047	3.7885	3.7713	3.7593	3.7468	
util living area													
	0.9888	0.9785	0.9555	0.8912	0.7729	0.6034	0.4574	0.5120	0.7504	0.9325	0.9803	0.9907	(86)
MIT	19.1421	19.4031	19.8024	20.3200	20.7067	20.9171	20.9776	20.9659	20.8072	20.2704	19.6179	19.1041	(87)
Th 2	20.0363	20.0385	20.0406	20.0504	20.0523	20.0609	20.0609	20.0625	20.0576	20.0523	20.0485	20.0446	(88)
util rest of house													
	0.9865	0.9740	0.9459	0.8682	0.7271	0.5306	0.3659	0.4174	0.6850	0.9132	0.9754	0.9887	(89)
MIT 2	17.8544	18.1872	18.6919	19.3344	19.7814	20.0021	20.0503	20.0450	19.9030	19.2892	18.4697	17.8114	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.1084	18.4271	18.9110	19.5288	19.9640	20.1826	20.2332	20.2267	20.0814	19.4828	18.6962	18.0664	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1084	18.4271	18.9110	19.5288	19.9640	20.1826	20.2332	20.2267	20.0814	19.4828	18.6962	18.0664	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9796	0.9636	0.9314	0.8532	0.7224	0.5405	0.3832	0.4346	0.6868	0.8985	0.9656	0.9827	(94)
Useful gains	768.9707	895.5840	994.2154	1058.4903	973.6807	724.7520	490.5422	510.9485	721.5811	794.2390	751.9779	733.6856	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1951.9760	1907.5073	1745.8913	1478.1855	1146.8263	766.9422	499.1361	524.7305	824.9422	1232.6999	1616.2744	1941.4686	(97)
Space heating kWh													
	880.1560	680.0125	559.2468	302.1806	128.8203	0.0000	0.0000	0.0000	0.0000	326.2149	622.2934	898.5906	(98a)
Space heating requirement - total per year (kWh/year)												4397.5150	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	880.1560	680.0125	559.2468	302.1806	128.8203	0.0000	0.0000	0.0000	0.0000	326.2149	622.2934	898.5906	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4397.5150	
Space heating per m2											(98c) / (4) =	32.8737	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	880.1560	680.0125	559.2468	302.1806	128.8203	0.0000	0.0000	0.0000	0.0000	326.2149	622.2934	898.5906	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	952.5497	735.9442	605.2455	327.0352	139.4159	0.0000	0.0000	0.0000	0.0000	353.0464	673.4777	972.5006	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652 (64)

Efficiency of water heater 80.3000 (216)

(217)m	86.8225	86.6029	86.1465	85.1634	83.4279	80.3000	80.3000	80.3000	80.3000	85.2981	86.4400	86.8714 (217)

Fuel for water heating, kWh/month

	291.6634	258.4897	276.1611	246.2380	244.0021	228.8498	226.3471	235.2227	237.6393	248.9481	260.5286	288.4324 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4759.2154 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	3042.5224 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	264.9585 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-2334.4611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5818.2352 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4759.2154	0.2100	999.4352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3042.5224	0.2100	638.9297	(264)
Space and water heating			1638.3649	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1386.3679	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4759.2154	1.1300	5377.9134	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3042.5224	1.1300	3438.0503	(278)
Space and water heating			8815.9637	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			7248.7924	(286)
Target Primary Energy Rate (TPER)			54.1900	(287)

Full SAP Calculation Printout

Plot Reference	Plot 60	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 ET
Plot Address	22 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	8.96	**TER**	10.36
Environmental	91 B	**% DER < TER**			13.51
CO_2 Emissions (t/year)	1.01	**DFEE**	34.57	**TFEE**	37.68
Compliance Check	See BREL	**% DFEE < TFEE**			8.25
% DPER < TPER	11.23	**DPER**	48.11	**TPER**	54.19

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8200	(17)
Infiltration rate		0.2571	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2186	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2787	0.2732	0.2677	0.2404	0.2350	0.2076	0.2076	0.2022	0.2186	0.2350	0.2459	0.2568	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5388	0.5373	0.5358	0.5289	0.5276	0.5216	0.5216	0.5204	0.5239	0.5276	0.5302	0.5330	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.2735			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)

Internal Floor 2	43.2700	18.0000	778.8600	(32d)
Internal Ceiling 1	47.2300	9.0000	425.0700	(32e)
Internal Ceiling 2	43.2700	9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0850 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 71.3585 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	61.2415	61.0702	60.9022	60.1132	59.9656	59.2784	59.2784	59.1511	59.5431	59.9656	60.2642	60.5764	(38)
Heat transfer coeff	132.6001	132.4287	132.2607	131.4717	131.3241	130.6369	130.6369	130.5097	130.9016	131.3241	131.6228	131.9350	(39)

Average = Sum(39)m / 12 = 131.4710

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9913	0.9900	0.9887	0.9828	0.9817	0.9766	0.9766	0.9756	0.9786	0.9817	0.9839	0.9863	(40)
HLP (average)												0.9828	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 69.5228 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)

Energy content (annual) Total = Sum(45)m = 1154.6247
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)

Total per year (kWh/year) = Sum(64)m = 981.4310 (64)
12Total per year (kWh/year) 981 (64)
Electric shower(s)

58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 664.1943 (64a)
Heat gains from water heating, kWh/month

40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
West	5.8500	19.6403	0.6300	0.7000	0.7700	35.1136	(80)
East	9.1200	19.6403	0.6300	0.7000	0.7700	54.7412	(76)
West	7.1600	19.6403	0.6300	0.7000	0.7700	42.9766	(80)

Solar gains	132.8313	259.8463	427.9298	624.1101	764.8704	782.9809	745.4298	640.3132	497.7001	308.3295	165.6251	109.2340	(83)
Total gains	713.5383	859.2599	1000.4149	1181.1315	1292.8114	1293.5844	1236.1338	1129.4664	1001.8052	826.8981	714.4737	676.1693	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.5054	43.5617	43.6170	43.8788	43.9281	44.1592	44.1592	44.2023	44.0699	43.9281	43.8285	43.7247	
alpha	3.9004	3.9041	3.9078	3.9253	3.9285	3.9439	3.9439	3.9468	3.9380	3.9285	3.9219	3.9150	
util living area	0.9918	0.9826	0.9608	0.8960	0.7738	0.6001	0.4526	0.5100	0.7542	0.9400	0.9846	0.9933	(86)
MIT	19.2018	19.4626	19.8576	20.3630	20.7357	20.9284	20.9816	20.9709	20.8232	20.2958	19.6534	19.1538	(87)
Th 2	20.0906	20.0917	20.0927	20.0977	20.0986	20.1029	20.1029	20.1037	20.1012	20.0986	20.0967	20.0948	(88)
util rest of house	0.9901	0.9790	0.9524	0.8742	0.7295	0.5300	0.3655	0.4192	0.6912	0.9228	0.9808	0.9919	(89)
MIT 2	18.4349	18.6942	19.0836	19.5718	19.9073	20.0630	20.0960	20.0919	19.9897	19.5191	18.8891	18.3902	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.5862	18.8458	19.2363	19.7279	20.0707	20.2337	20.2707	20.2653	20.1542	19.6723	19.0398	18.5408	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5862	18.8458	19.2363	19.7279	20.0707	20.2337	20.2707	20.2653	20.1542	19.6723	19.0398	18.5408	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9861	0.9724	0.9425	0.8639	0.7280	0.5407	0.3822	0.4362	0.6953	0.9127	0.9747	0.9885	(94)
Useful gains	703.5874	835.5332	942.9305	1020.3709	941.1438	699.4136	472.4544	492.6447	696.5470	754.7094	696.3975	668.3842	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1894.3469	1846.8197	1684.5161	1423.5643	1099.2793	735.9705	479.5292	504.4587	792.4999	1191.4130	1571.5556	1892.0589	(97)
Space heating kWh	885.9251	679.5845	551.7397	290.2993	117.6528	0.0000	0.0000	0.0000	0.0000	324.9075	630.1139	910.4140	(98a)
Space heating requirement - total per year (kWh/year)												4390.6367	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	885.9251	679.5845	551.7397	290.2993	117.6528	0.0000	0.0000	0.0000	0.0000	324.9075	630.1139	910.4140	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4390.6367	
Space heating per m2											(98c) / (4) =	32.8223	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1227.9872	966.7133	991.8736	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8561	0.9106	0.8797	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1051.2779	880.3342	872.5606	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1441.1038	1377.1260	1255.6461	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	280.6746	369.6131	285.0156	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	70.1687	92.4033	71.2539	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												233.8258	(107)
Energy for space heating												32.8223	(99)
Energy for space cooling												1.7480	(108)
Total												34.5703	(109)
Fabric Energy Efficiency (DFEE)												34.6	(109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b)	x 2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c)	x 2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d)	x 2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E13 Gable (insulation at rafter level)	2.3700	0.0800	0.1896

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9543	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 75.5851	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff	141.3612	141.0137	140.6731	139.0735	138.7742	137.3809	137.3809	137.1229	137.9176	138.7742	139.3796	140.0126	(39)
Average = Sum(39)m / 12 =												139.0720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0567	1.0542	1.0516	1.0396	1.0374	1.0270	1.0270	1.0251	1.0310	1.0374	1.0419	1.0467	(40)
HLP (average)												1.0396	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)
Hot water usage for other uses	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)
Average daily hot water use (litres/day)												69.5228	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8495	73.7685	71.4966	68.6693	66.1469	63.5255	62.9812	65.2484	67.5737	70.2656	73.1179	75.7431	(44)
Energy conte	120.1270	105.0453	109.8877	94.0048	89.0464	78.1121	76.1702	80.7911	83.3251	95.3497	104.1699	118.5953	(45)
Energy content (annual)										Total = Sum(45)m =		1154.6247	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	102.1080	89.2885	93.4045	79.9041	75.6894	66.3952	64.7447	68.6725	70.8263	81.0473	88.5444	100.8060	(64)
										Total per year (kWh/year) = Sum(64)m =		981.4310	(64)
12Total per year (kWh/year)												981	(64)
Electric shower(s)													
	58.3910	52.0269	56.8113	54.2144	55.2317	52.6857	54.4419	55.2317	54.2144	56.8113	55.7431	58.3910	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		664.1943	(64a)
Heat gains from water heating, kWh/month													
	40.1247	35.3288	37.5540	33.5296	32.7303	29.7702	29.7966	30.9760	31.2602	34.4647	36.0719	39.7993	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	53.9311	52.5727	50.4758	46.5689	43.9923	41.3475	40.0492	41.6345	43.4169	46.3235	50.0998	53.4936	(72)
Total internal gains													
	580.7070	599.4136	572.4850	557.0213	527.9411	510.6034	490.7041	489.1533	504.1051	518.5686	548.8486	566.9352	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.1200	19.6403	0.6300	0.7000	0.7700	54.7412	(76)
West	13.0100	19.6403	0.6300	0.7000	0.7700	78.0902	(80)

Solar gains	132.8313	259.8463	427.9298	624.1101	764.8704	782.9809	745.4298	640.3132	497.7001	308.3295	165.6251	109.2340	(83)
Total gains	713.5383	859.2599	1000.4149	1181.1315	1292.8114	1293.5844	1236.1338	1129.4664	1001.8052	826.8981	714.4737	676.1693	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8091	40.9097	41.0087	41.4804	41.5699	41.9914	41.9914	42.0704	41.8280	41.5699	41.3893	41.2022	
alpha	3.7206	3.7273	3.7339	3.7654	3.7713	3.7994	3.7994	3.8047	3.7885	3.7713	3.7593	3.7468	
util living area													
	0.9918	0.9832	0.9631	0.9035	0.7897	0.6202	0.4720	0.5298	0.7704	0.9438	0.9850	0.9933	(86)
MIT	19.0617	19.3273	19.7362	20.2748	20.6822	20.9090	20.9751	20.9618	20.7876	20.2187	19.5477	19.0241	(87)
Th 2	20.0363	20.0385	20.0406	20.0504	20.0523	20.0609	20.0609	20.0625	20.0576	20.0523	20.0485	20.0446	(88)
util rest of house													
	0.9901	0.9796	0.9550	0.8823	0.7453	0.5468	0.3783	0.4331	0.7066	0.9271	0.9812	0.9919	(89)
MIT 2	18.2563	18.5213	18.9257	19.4514	19.8217	20.0102	20.0516	20.0471	19.9233	19.4097	18.7492	18.2248	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.4151	18.6803	19.0856	19.6138	19.9915	20.1875	20.2338	20.2275	20.0938	19.5693	18.9067	18.3825	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4151	18.6803	19.0856	19.6138	19.9915	20.1875	20.2338	20.2275	20.0938	19.5693	18.9067	18.3825	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9859	0.9728	0.9447	0.8709	0.7421	0.5572	0.3961	0.4509	0.7094	0.9163	0.9750	0.9883	(94)
Useful gains	703.4689	835.8745	945.0679	1028.6277	959.4088	720.8226	489.5976	509.2346	710.6467	757.7040	696.5762	668.2464	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1995.3333	1943.2078	1770.4615	1490.0072	1150.6437	767.6152	499.2171	524.8422	826.6501	1244.7117	1645.6193	1985.7276	(97)
Space heating kWh													
	961.1471	744.1280	614.0928	332.1933	142.2787	0.0000	0.0000	0.0000	0.0000	362.3337	683.3111	980.2060	(98a)
Space heating requirement - total per year (kWh/year)												4819.6907	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	961.1471	744.1280	614.0928	332.1933	142.2787	0.0000	0.0000	0.0000	0.0000	362.3337	683.3111	980.2060	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4819.6907	
Space heating per m2											(98c) / (4) =	36.0297	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Full SAP Calculation Printout

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1291.3807	1016.6189	1042.1342	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8327	0.8923	0.8586	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1075.3209	907.1021	894.7375	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1441.1038	1377.1260	1255.6461	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	263.3637	349.6978	268.5160	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	65.8409	87.4245	67.1290	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												220.3944	(107)
Energy for space heating												36.0297	(99)
Energy for space cooling												1.6476	(108)
Total												37.6772	(109)
Fabric Energy Efficiency (TFEE)												37.7	(109)

Full SAP Calculation Printout

Plot Reference	Plot 60	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 ET
Plot Address	22 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	8.96	**TER**	10.36
Environmental	91 B	**% DER < TER**			13.51
CO_2 Emissions (t/year)	1.01	**DFEE**	34.57	**TFEE**	37.68
Compliance Check	See BREL	**% DFEE < TFEE**			8.25
% DPER < TPER	11.23	**DPER**	48.11	**TPER**	54.19

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8200	(17)
Infiltration rate		0.1410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1198	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1528	0.1498	0.1468	0.1318	0.1288	0.1139	0.1139	0.1109	0.1198	0.1288	0.1348	0.1408	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.2735			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0850 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 71.3585 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	(39)

Average = Sum(39)m / 12 = 128.1868

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	(40)
HLP (average)												0.9583	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892
Distribution loss (46)m = 0.15 x (45)m

29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

PV diverter
Solar input
FGHRS
Output from w/h

203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)

Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)
12Total per year (kWh/year) 2020 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	633.6460	651.2265	621.8349	600.5850	568.0674	544.1116	521.8038	521.9486	538.9333	560.4304	596.2403	619.0985	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.8500	19.6403	0.6300	0.7000	0.7700	35.1136	(80)
East	9.1200	19.6403	0.6300	0.7000	0.7700	54.7412	(76)
West	7.1600	19.6403	0.6300	0.7000	0.7700	42.9766	(80)

Solar gains	132.8313	259.8463	427.9298	624.1101	764.8704	782.9809	745.4298	640.3132	497.7001	308.3295	165.6251	109.2340 (83)
Total gains	766.4773	911.0728	1049.7647	1224.6951	1332.9377	1327.0925	1267.2336	1162.2618	1036.6334	868.7599	761.8653	728.3325 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	
alpha	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	
util living area	0.9894	0.9784	0.9530	0.8820	0.7531	0.5803	0.4352	0.4902	0.7321	0.9288	0.9806	0.9913	(86)
MIT	19.3353	19.5882	19.9665	20.4330	20.7732	20.9395	20.9849	20.9760	20.8488	20.3663	19.7540	19.2761	(87)
Th 2	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	(88)
util rest of house	0.9872	0.9741	0.9434	0.8586	0.7080	0.5120	0.3522	0.4032	0.6685	0.9094	0.9759	0.9895	(89)
MIT 2	18.1542	18.4752	18.9511	19.5211	19.9092	20.0752	20.1110	20.1058	19.9971	19.4537	18.6885	18.0788	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.3873	18.6948	19.1514	19.7010	20.0796	20.2457	20.2834	20.2775	20.1651	19.6338	18.8987	18.3150	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2373	18.5448	19.0014	19.5510	19.9296	20.0957	20.1334	20.1275	20.0151	19.4838	18.7487	18.1650	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9804	0.9633	0.9278	0.8410	0.6975	0.5102	0.3537	0.4041	0.6603	0.8917	0.9656	0.9836	(94)
Useful gains	751.4351	877.6623	973.9495	1029.9315	929.7403	677.0811	448.1619	469.6849	684.5233	774.6808	735.6761	716.3638	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1786.5721	1749.0780	1602.5210	1365.3127	1054.9272	704.4773	452.9388	477.8164	758.2369	1138.7811	1493.2138	1790.1342	(97)
Space heating kWh	770.1420	585.5914	467.6572	241.4744	93.1391	0.0000	0.0000	0.0000	0.0000	270.8906	545.4271	798.8852	(98a)
Space heating requirement - total per year (kWh/year)												3773.2069	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	770.1420	585.5914	467.6572	241.4744	93.1391	0.0000	0.0000	0.0000	0.0000	270.8906	545.4271	798.8852	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3773.2069	
Space heating per m2											(98c) / (4) =	28.2067	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	770.1420	585.5914	467.6572	241.4744	93.1391	0.0000	0.0000	0.0000	0.0000	270.8906	545.4271	798.8852	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	872.1879	663.1839	529.6231	273.4705	105.4803	0.0000	0.0000	0.0000	0.0000	306.7844	617.6977	904.7398	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0893	88.0638	88.0094	87.8910	87.6666	87.3000	87.3000	87.3000	87.3000	87.9157	88.0507	88.0972	(217)
Fuel for water heating, kWh/month	230.6781	203.3625	215.1891	187.9677	181.4738	162.9741	160.3261	167.6338	170.4392	190.1188	203.4245	228.0196	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.4618	-60.0609	-88.8559	-102.9269	-113.5609	-107.0227	-105.7369	-98.5479	-86.1799	-70.0244	-46.1543	-35.6548	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.3933	-41.4888	-84.0948	-128.8611	-172.7937	-174.5094	-172.0747	-144.1775	-103.9228	-59.7933	-26.0286	-15.2705	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	4273.1675	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.6073	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2098.5959	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5107.8894	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4273.1675	0.2100	897.3652	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.6073	0.2100	483.3375	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1380.7027	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	0.1340	-128.1068	
PV Unit electricity exported	-1142.4085	0.1254	-143.2342	
Total			-271.3409	(269)
Total CO2, kg/year			1198.4404	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.9600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4273.1675	1.1300	4828.6793	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.6073	1.1300	2600.8162	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			7429.4955	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	1.4951	-1429.6152	
PV Unit electricity exported	-1142.4085	0.4602	-525.7398	
Total			-1955.3550	(283)
Total Primary energy kWh/year			6435.2298	(286)
Dwelling Primary energy Rate (DPER)			48.1100	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300	(1b) x	2.4000	(2b) =	113.3520	(1b) - (3b)
First floor	43.2700	(1c) x	2.6700	(2c) =	115.5309	(1c) - (3c)
Second floor	43.2700	(1d) x	2.6700	(2d) =	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.1161	(8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000	(17)
Infiltration rate												0.3661	(18)
Number of sides sheltered												2	(19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.3112	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3968	0.3890	0.3812	0.3423	0.3346	0.2957	0.2957	0.2879	0.3112	0.3346	0.3501	0.3657	(22b)
Effective ac	0.5787	0.5757	0.5727	0.5586	0.5560	0.5437	0.5437	0.5414	0.5484	0.5560	0.5613	0.5669	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			2.1500	1.0000	2.1500			(26a)
TER Opening Type			22.1300	1.1450	25.3397			(27)
Ground FLoor			47.2300	0.1300	6.1399			(28a)
Brickwork	145.9800	24.2800	121.7000	0.1800	21.9060			(29a)
Cold Roof-500mm	32.2000		32.2000	0.1100	3.5420			(30)
Flat Roof	3.9100		3.9100	0.1100	0.4301			(30)
Sloping roof	10.2100		10.2100	0.1100	1.1231			(30)
Total net area of external elements Aum(A, m2)			239.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.6308			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	155.2498	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0500	0.4151
E4 Jamb	45.3100	0.0500	2.2655
E5 Ground floor (normal)	19.4400	0.1600	3.1104
E6 Intermediate floor within a dwelling	37.2200	0.0000	0.0000
E16 Corner (normal)	16.0000	0.0900	1.4400
E18 Party wall between dwellings	16.0000	0.0600	0.9600
P1 Party wall - Ground floor	9.9700	0.0800	0.7976
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0800	0.7976
E11 Eaves (insulation at rafter level)	9.1300	0.0400	0.3652
E12 Gable (insulation at ceiling level)	7.1200	0.0600	0.4272
E15 Flat roof with parapet	6.4100	0.5600	3.5896
E13 Gable (insulation at rafter level)	2.3700	0.0800	0.1896

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	14.9543	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	75.5851	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.7761	65.4286	65.0880	63.4884	63.1891	61.7958	61.7958	61.5378	62.3325	63.1891	63.7945	64.4275	(38)
Heat transfer coeff													
	141.3612	141.0137	140.6731	139.0735	138.7742	137.3809	137.3809	137.1229	137.9176	138.7742	139.3796	140.0126	(39)
Average = Sum(39)m / 12 =												139.0720	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0567	1.0542	1.0516	1.0396	1.0374	1.0270	1.0270	1.0251	1.0310	1.0374	1.0419	1.0467	(40)
HLP (average)												1.0396	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.9128	71.8171	70.2204	67.1654	64.9108	62.3966	60.9675	62.5522	64.2892	66.9887	70.1093	72.6334	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	136.7459	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.7623	145.5855	141.7170	135.8346	131.0577	125.9222	123.9487	127.8005	131.8629	137.2543	143.2273	148.3765	(44)
Energy conte	235.6031	207.3119	217.8137	185.9508	176.4289	154.8360	149.9052	158.2438	162.6001	186.2528	204.0535	232.3217	(45)
Energy content (annual)										Total = Sum(45)m =		2271.3215	
Distribution loss (46)m = 0.15 x (45)m													
	35.3405	31.0968	32.6721	27.8926	26.4643	23.2254	22.4858	23.7366	24.3900	27.9379	30.6080	34.8483	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	286.5620	253.3393	268.7727	235.2659	227.3878	204.1511	200.8641	209.2027	211.9152	237.2117	253.3686	283.2806	(62)
WWHRS	-33.3327	-29.4797	-30.8694	-25.5611	-23.8220	-20.3847	-19.1074	-20.3188	-21.0908	-24.8637	-28.1676	-32.7154	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652	(64)
										Total per year (kWh/year) = Sum(64)m =		2561.6081	(64)
12Total per year (kWh/year)												2562	(64)
Electric shower(s)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.0777	80.4380	85.1628	74.1574	71.4023	63.8117	62.5832	65.3558	66.3933	74.6688	80.1766	89.9867	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	145.2073	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.0044	174.9334	158.0044	163.2712	158.0044	163.2712	158.0044	158.0044	163.2712	158.0044	163.2712	158.0044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	302.2093	305.3453	297.4427	280.6190	259.3822	239.4225	226.0882	222.9523	230.8548	247.6785	268.9154	288.8750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	37.5207	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	122.4163	119.6995	114.4661	102.9964	95.9709	88.6274	84.1172	87.8438	92.2129	100.3613	111.3563	120.9499	(72)
Total internal gains													
	652.1922	669.5404	639.4754	616.4488	582.9196	557.8833	534.7720	535.3626	552.9012	575.6064	613.1051	637.3915	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.1200	19.6403	0.6300	0.7000	0.7700	54.7412	(76)
West	13.0100	19.6403	0.6300	0.7000	0.7700	78.0902	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	132.8313	259.8463	427.9298	624.1101	764.8704	782.9809	745.4298	640.3132	497.7001	308.3295	165.6251	109.2340	(83)
Total gains	785.0236	929.3867	1067.4052	1240.5590	1347.7900	1340.8642	1280.2018	1175.6758	1050.6012	883.9359	778.7302	746.6255	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.8091	40.9097	41.0087	41.4804	41.5699	41.9914	41.9914	42.0704	41.8280	41.5699	41.3893	41.2022	
alpha	3.7206	3.7273	3.7339	3.7654	3.7713	3.7994	3.7994	3.8047	3.7885	3.7713	3.7593	3.7468	
util living area													
	0.9888	0.9785	0.9555	0.8912	0.7729	0.6034	0.4574	0.5120	0.7504	0.9325	0.9803	0.9907	(86)
MIT	19.1421	19.4031	19.8024	20.3200	20.7067	20.9171	20.9776	20.9659	20.8072	20.2704	19.6179	19.1041	(87)
Th 2	20.0363	20.0385	20.0406	20.0504	20.0523	20.0609	20.0609	20.0625	20.0576	20.0523	20.0485	20.0446	(88)
util rest of house													
	0.9865	0.9740	0.9459	0.8682	0.7271	0.5306	0.3659	0.4174	0.6850	0.9132	0.9754	0.9887	(89)
MIT 2	17.8544	18.1872	18.6919	19.3344	19.7814	20.0021	20.0503	20.0450	19.9030	19.2892	18.4697	17.8114	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.1084	18.4271	18.9110	19.5288	19.9640	20.1826	20.2332	20.2267	20.0814	19.4828	18.6962	18.0664	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1084	18.4271	18.9110	19.5288	19.9640	20.1826	20.2332	20.2267	20.0814	19.4828	18.6962	18.0664	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9796	0.9636	0.9314	0.8532	0.7224	0.5405	0.3832	0.4346	0.6868	0.8985	0.9656	0.9827	(94)
Useful gains	768.9707	895.5840	994.2154	1058.4903	973.6807	724.7520	490.5422	510.9485	721.5811	794.2390	751.9779	733.6856	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1951.9760	1907.5073	1745.8913	1478.1855	1146.8263	766.9422	499.1361	524.7305	824.9422	1232.6999	1616.2744	1941.4686	(97)
Space heating kWh													
	880.1560	680.0125	559.2468	302.1806	128.8203	0.0000	0.0000	0.0000	0.0000	326.2149	622.2934	898.5906	(98a)
Space heating requirement - total per year (kWh/year)												4397.5150	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	880.1560	680.0125	559.2468	302.1806	128.8203	0.0000	0.0000	0.0000	0.0000	326.2149	622.2934	898.5906	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4397.5150	
Space heating per m2											(98c) / (4) =	32.8737	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	880.1560	680.0125	559.2468	302.1806	128.8203	0.0000	0.0000	0.0000	0.0000	326.2149	622.2934	898.5906	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	952.5497	735.9442	605.2455	327.0352	139.4159	0.0000	0.0000	0.0000	0.0000	353.0464	673.4777	972.5006	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)

Space heating fuel (secondary)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating

Water heating requirement

	253.2293	223.8596	237.9032	209.7048	203.5657	183.7664	181.7567	188.8839	190.8244	212.3480	225.2010	250.5652 (64)

Efficiency of water heater 80.3000 (216)

(217)m	86.8225	86.6029	86.1465	85.1634	83.4279	80.3000	80.3000	80.3000	80.3000	85.2981	86.4400	86.8714 (217)

Fuel for water heating, kWh/month

	291.6634	258.4897	276.1611	246.2380	244.0021	228.8498	226.3471	235.2227	237.6393	248.9481	260.5286	288.4324 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	32.8302	26.3376	23.7141	17.3740	13.4201	10.9644	12.2423	15.9130	20.6694	27.1194	30.6313	33.7426 (232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-45.3472	-64.5364	-93.6059	-106.1845	-115.2228	-107.7221	-106.3130	-99.9728	-88.9622	-74.1451	-50.0385	-39.1282 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-23.8068	-50.2818	-100.3389	-151.3149	-200.7149	-201.9807	-199.6849	-168.8500	-123.4115	-72.2054	-31.8751	-18.8174 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	4759.2154 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	3042.5224 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	264.9585 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-2334.4611 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5818.2352 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4759.2154	0.2100	999.4352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3042.5224	0.2100	638.9297	(264)
Space and water heating			1638.3649	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.9585	0.1443	38.2417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	0.1344	-133.2281	
PV Unit electricity exported	-1343.2823	0.1258	-168.9399	
Total			-302.1680	(269)
Total CO2, kg/year			1386.3679	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4759.2154	1.1300	5377.9134	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3042.5224	1.1300	3438.0503	(278)
Space and water heating			8815.9637	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	264.9585	1.5338	406.4021	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-991.1787	1.4968	-1483.5579	
PV Unit electricity exported	-1343.2823	0.4616	-620.1164	
Total			-2103.6743	(283)
Total Primary energy kWh/year			7248.7924	(286)
Target Primary Energy Rate (TPER)			54.1900	(287)

Full SAP Calculation Printout

Plot Reference	Plot 60	**Issued on Date**	24/04/2026
Assessment Reference	As Built	**Plot Type Ref**	HT 1 ET
Plot Address	22 Carters Close, READING, RG1 8GN	**SAP Version**	10.2

SAP Rating	93 A	**DER**	8.96	**TER**	10.36
Environmental	91 B	**% DER < TER**			13.51
CO_2 Emissions (t/year)	1.01	**DFEE**	34.57	**TFEE**	37.68
Compliance Check	See BREL	**% DFEE < TFEE**			8.25
% DPER < TPER	11.23	**DPER**	48.11	**TPER**	54.19

Assessor Details	Mr. Matthew Fitzpatrick	**Assessor ID**	7601-0001
Client	BW 01, Bellway Thames Valley		

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8200	(17)
Infiltration rate		0.1410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1198	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1528	0.1498	0.1468	0.1318	0.1288	0.1139	0.1139	0.1109	0.1198	0.1288	0.1348	0.1408	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.2735			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)

Internal Wall 3	70.0800		9.0000	630.7200 (32c)
Internal Floor 1	43.2700		18.0000	778.8600 (32d)
Internal Floor 2	43.2700		18.0000	778.8600 (32d)
Internal Ceiling 1	47.2300		9.0000	425.0700 (32e)
Internal Ceiling 2	43.2700		9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.2498 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0850 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 71.3585 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	(39)

Average = Sum(39)m / 12 = 128.1868

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	(40)
HLP (average)												0.9583	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9041 (42)
Hot water usage for mixer showers

48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)

Energy content (annual) Total = Sum(45)m = 1899.0892
Distribution loss (46)m = 0.15 x (45)m

29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)

Total heat required for water heating calculated for each month

224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS -21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)

Total per year (kWh/year) = Sum(64)m = 2020.4955 (64)
Electric shower(s)

19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 221.3981 (64a)
Heat gains from water heating, kWh/month

77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.8500	19.6403	0.6300	0.7000	0.7700	35.1136	(80)
East	9.1200	19.6403	0.6300	0.7000	0.7700	54.7412	(76)
West	7.1600	19.6403	0.6300	0.7000	0.7700	42.9766	(80)

Solar gains	132.8313	259.8463	427.9298	624.1101	764.8704	782.9809	745.4298	640.3132	497.7001	308.3295	165.6251	109.2340 (83)
Total gains	838.4829	963.8577	1109.8953	1265.2518	1363.5639	1340.4364	1280.2303	1177.5501	1056.2383	907.9387	810.9747	794.7241 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	
alpha	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	
util living area	0.9856	0.9741	0.9446	0.8723	0.7430	0.5756	0.4311	0.4845	0.7236	0.9196	0.9762	0.9882	(86)
MIT	19.4172	19.6453	20.0242	20.4612	20.7845	20.9412	20.9854	20.9770	20.8552	20.4001	19.8076	19.3524	(87)
Th 2	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	(88)
util rest of house	0.9826	0.9689	0.9336	0.8477	0.6975	0.5076	0.3487	0.3982	0.6596	0.8984	0.9705	0.9858	(89)
MIT 2	18.2582	18.5470	19.0219	19.5535	19.9204	20.0765	20.1113	20.1064	20.0028	19.4933	18.7559	18.1758	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.4868	18.7637	19.2197	19.7326	20.0909	20.2471	20.2837	20.2781	20.1710	19.6722	18.9634	18.4080	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3368	18.6137	19.0697	19.5826	19.9409	20.0971	20.1337	20.1281	20.0210	19.5222	18.8134	18.2580	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9743	0.9571	0.9171	0.8303	0.6875	0.5059	0.3502	0.3992	0.6519	0.8804	0.9590	0.9785	(94)
Useful gains	816.8984	922.4632	1017.8759	1050.5737	937.4695	678.0673	448.3652	470.1089	688.5502	799.3818	777.7113	777.6377	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1799.3382	1757.9115	1611.2655	1369.3649	1056.3707	704.6557	452.9773	477.8960	758.9903	1143.7045	1501.4972	1802.0448	(97)
Space heating kWh	730.9352	561.4213	441.4819	229.5297	88.4625	0.0000	0.0000	0.0000	0.0000	256.1761	521.1258	762.1589	(98a)
Space heating requirement - total per year (kWh/year)												3591.2913	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	730.9352	561.4213	441.4819	229.5297	88.4625	0.0000	0.0000	0.0000	0.0000	256.1761	521.1258	762.1589	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3591.2913	
Space heating per m2											(98c) / (4) =	26.8468	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												88.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	730.9352	561.4213	441.4819	229.5297	88.4625	0.0000	0.0000	0.0000	0.0000	256.1761	521.1258	762.1589	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	827.7861	635.8112	499.9795	259.9431	100.1840	0.0000	0.0000	0.0000	0.0000	290.1202	590.1765	863.1471	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0805	88.0561	87.9974	87.8787	87.6547	87.3000	87.3000	87.3000	87.3000	87.9024	88.0420	88.0895	(217)
Fuel for water heating, kWh/month	230.7012	203.3802	215.2185	187.9941	181.4984	162.9741	160.3261	167.6338	170.4392	190.1476	203.4444	228.0396	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.4618	-60.0609	-88.8559	-102.9269	-113.5609	-107.0227	-105.7369	-98.5479	-86.1799	-70.0244	-46.1543	-35.6548	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.3933	-41.4888	-84.0948	-128.8611	-172.7937	-174.5094	-172.0747	-144.1775	-103.9228	-59.7933	-26.0286	-15.2705	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4067.1476	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2301.7971	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2098.5959	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4902.0593	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4067.1476	3.6400	148.0442	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.7971	3.6400	83.7854	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	16.4900	-157.6753	
PV Unit electricity exported	-1142.4085	5.5900	-63.8606	
Total			-221.5359	(252)
Total energy cost			206.4627	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4158	(257)
SAP value		93.2604	
SAP rating (Section 12)		93	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4067.1476	0.2100	854.1010	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.7971	0.2100	483.3774	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1337.4784	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	0.1340	-128.1068	
PV Unit electricity exported	-1142.4085	0.1254	-143.2342	
Total			-271.3409	(269)
Total CO2, kg/year			1155.2160	(272)
CO2 emissions per m2			8.6400	(273)
EI value			91.3409	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 133.7700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		344.4138	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8200	(17)
Infiltration rate		0.1410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1198	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1288	0.1228	0.1228	0.1139	0.1169	0.1019	0.1019	0.0989	0.1019	0.1139	0.1109	0.1198	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.2735			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0850 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	71.3585 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	(39)
Average = Sum(39)m / 12 =												128.1868	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	(40)
HLP (average)												0.9583	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9041	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223	(42a)

Hot water usage for baths

31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717	(42b)

Hot water usage for other uses

44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714	(42c)

Average daily hot water use (litres/day)	114.3382	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.8500	23.8018	0.6300	0.7000	0.7700	42.5537	(80)
East	9.1200	23.8018	0.6300	0.7000	0.7700	66.3401	(76)
West	7.1600	23.8018	0.6300	0.7000	0.7700	52.0828	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	160.9765	275.0545	448.8805	662.9085	790.0921	854.9807	806.1651	710.9617	555.9502	350.1125	197.7213	133.1418	(83)
Total gains	866.6280	979.0659	1130.8460	1304.0502	1388.7856	1412.4362	1340.9656	1248.1987	1114.4884	949.7217	843.0709	818.6318	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	
alpha	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	
util living area	0.9810	0.9679	0.9297	0.8333	0.6707	0.4593	0.3133	0.3458	0.6326	0.8856	0.9665	0.9843	(86)
MIT	19.5693	19.7794	20.1667	20.5951	20.8714	20.9785	20.9965	20.9949	20.9228	20.5463	19.9745	19.5159	(87)
Th 2	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	(88)
util rest of house	0.9770	0.9614	0.9155	0.8018	0.6158	0.3862	0.2307	0.2578	0.5574	0.8555	0.9584	0.9809	(89)
MIT 2	18.4518	18.7168	19.1989	19.7099	20.0100	20.1059	20.1172	20.1166	20.0644	19.6667	18.9664	18.3844	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.6723	18.9264	19.3898	19.8845	20.1800	20.2780	20.2907	20.2899	20.2337	19.8402	19.1653	18.6076	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5223	18.7764	19.2398	19.7345	20.0300	20.1280	20.1407	20.1399	20.0837	19.6902	19.0153	18.4576	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9670	0.9481	0.8980	0.7862	0.6100	0.3871	0.2328	0.2599	0.5543	0.8380	0.9446	0.9720	(94)
Useful gains	838.0202	928.2201	1015.5239	1025.3062	847.1047	546.7023	312.1521	324.4632	617.7155	795.8494	796.3606	795.7410	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1720.5598	1676.2211	1517.7064	1260.6555	913.9669	554.7954	312.8631	325.5782	651.6670	1049.8790	1412.0152	1712.2664	(97)
Space heating kWh	656.6094	502.6567	373.6237	169.4515	49.7455	0.0000	0.0000	0.0000	0.0000	188.9980	443.2713	681.8950	(98a)
Space heating requirement - total per year (kWh/year)												3066.2511	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													

	656.6094	502.6567	373.6237	169.4515	49.7455	0.0000	0.0000	0.0000	188.9980	443.2713	681.8950	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)											3066.2511	
Space heating per m2										(98c) / (4) =	22.9218	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)											0.0000	(201)
Fraction of space heat from main system(s)											1.0000	(202)
Efficiency of main space heating system 1 (in %)											88.3000	(206)
Efficiency of main space heating system 2 (in %)											0.0000	(207)
Efficiency of secondary/supplementary heating system, %											0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	656.6094	502.6567	373.6237	169.4515	49.7455	0.0000	0.0000	0.0000	0.0000	188.9980	443.2713	681.8950	(98)
Space heating efficiency (main heating system 1)													
	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)													
	743.6120	569.2601	423.1299	191.9043	56.3369	0.0000	0.0000	0.0000	0.0000	214.0408	502.0060	772.2480	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0616	88.0351	87.9611	87.8035	87.5361	87.3000	87.3000	87.3000	87.3000	87.8278	88.0099	88.0704	(217)
Fuel for water heating, kWh/month													
	230.7508	203.4286	215.3074	188.1551	181.7443	162.9741	160.3261	167.6338	170.4392	190.3090	203.5187	228.0890	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.7339	-61.9873	-91.0570	-106.1787	-115.2755	-111.6331	-109.7576	-103.8478	-91.4637	-75.6541	-52.2369	-41.3356	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-24.9225	-44.0591	-88.4624	-138.3922	-179.3881	-194.9470	-189.7286	-164.2186	-118.9921	-69.9171	-32.6846	-19.7997	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3472.5381	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2302.6762	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2273.6732	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4133.2515	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3472.5381	7.3200	254.1898	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.6762	7.3200	168.5559	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	27.6700	-278.9582	
PV Unit electricity exported	-1265.5121	5.8100	-73.5263	
Total			-352.4844	(252)
Total energy cost			353.0555	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3472.5381	0.2100	729.2330	(261)

Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.6762	0.2100	483.5620	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1212.7950	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	0.1342	-135.3132	
PV Unit electricity exported	-1265.5121	0.1253	-158.6057	
Total			-293.9190	(269)
Total CO2, kg/year			1007.9546	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3472.5381	1.1300	3923.9681	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.6762	1.1300	2602.0241	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6525.9921	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	1.4960	-1508.2213	
PV Unit electricity exported	-1265.5121	0.4599	-582.0632	
Total			-2090.2845	(283)
Total Primary energy kWh/year			5396.7969	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating: A 93
Current environmental impact rating: B 91

N Solar water heating	SAP increase too small
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.4	-£ 34	-146 kg (14.5%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 93
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 593 TEST (31 Mar 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£175	£175	£0
Mains gas	£531	£531	£0
Space heating	£409	£409	£0
Water heating	£230	£230	£0
Lighting	£67	£67	£0
Generated (PV)	-£352	-£352	£0
Total cost of fuels	£354	£354	£0
Total cost of uses	£354	£354	£0
Delivered energy	31 kWh/m²	31 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	40 kWh/m²	40 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)

Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 344.4138 (5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8200	(17)
Infiltration rate		0.1410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1198	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1528	0.1498	0.1468	0.1318	0.1288	0.1139	0.1139	0.1109	0.1198	0.1288	0.1348	0.1408	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)
Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000	(28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005	(29a)
Cold Roof-500mm	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000	(30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900	(30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900	(30)
Total net area of external elements Aum(A, m2)			207.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.2735			(33)
Main dwelling								
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501	(32)
Internal Wall 1			76.6200			9.0000	689.5800	(32c)
Internal Wall 2			86.3900			9.0000	777.5100	(32c)
Internal Wall 3			70.0800			9.0000	630.7200	(32c)
Internal Floor 1			43.2700			18.0000	778.8600	(32d)
Internal Floor 2			43.2700			18.0000	778.8600	(32d)
Internal Ceiling 1			47.2300			9.0000	425.0700	(32e)
Internal Ceiling 2			43.2700			9.0000	389.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0850 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	71.3585 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	(39)
Average = Sum(39)m / 12 =												128.1868	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	(40)
HLP (average)												0.9583	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.9041 (42)

Hot water usage for mixer showers
48.6085 47.8780 46.8136 44.7769 43.2739 41.5977 40.6450 41.7014 42.8595 44.6591 46.7396 48.4223 (42a)
Hot water usage for baths
31.4781 31.0106 30.3523 29.1384 28.2295 27.2217 26.6773 27.3310 28.0428 29.1212 30.3601 31.3717 (42b)
Hot water usage for other uses
44.3714 42.7578 41.1443 39.5308 37.9173 36.3038 36.3038 37.9173 39.5308 41.1443 42.7578 44.3714 (42c)
Average daily hot water use (litres/day) 114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month													
	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)													
	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month													
	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)
Water heating gains (Table 5)													
	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568	(72)
Total internal gains													
	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.8500	19.6403	0.6300	0.7000	0.7700	35.1136	(80)
East	9.1200	19.6403	0.6300	0.7000	0.7700	54.7412	(76)
West	7.1600	19.6403	0.6300	0.7000	0.7700	42.9766	(80)

Solar gains	132.8313	259.8463	427.9298	624.1101	764.8704	782.9809	745.4298	640.3132	497.7001	308.3295	165.6251	109.2340	(83)
Total gains	838.4829	963.8577	1109.8953	1265.2518	1363.5639	1340.4364	1280.2303	1177.5501	1056.2383	907.9387	810.9747	794.7241	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	
alpha	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	
util living area													
	0.9856	0.9741	0.9446	0.8723	0.7430	0.5756	0.4311	0.4845	0.7236	0.9196	0.9762	0.9882	(86)
MIT	19.4172	19.6453	20.0242	20.4612	20.7845	20.9412	20.9854	20.9770	20.8552	20.4001	19.8076	19.3524	(87)
Th 2	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	(88)
util rest of house													
	0.9826	0.9689	0.9336	0.8477	0.6975	0.5076	0.3487	0.3982	0.6596	0.8984	0.9705	0.9858	(89)
MIT 2	18.2582	18.5470	19.0219	19.5535	19.9204	20.0765	20.1113	20.1064	20.0028	19.4933	18.7559	18.1758	(90)
Living area fraction										fLA = Living area / (4) =		0.1973	(91)
MIT	18.4868	18.7637	19.2197	19.7326	20.0909	20.2471	20.2837	20.2781	20.1710	19.6722	18.9634	18.4080	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.3368	18.6137	19.0697	19.5826	19.9409	20.0971	20.1337	20.1281	20.0210	19.5222	18.8134	18.2580	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9743	0.9571	0.9171	0.8303	0.6875	0.5059	0.3502	0.3992	0.6519	0.8804	0.9590	0.9785	(94)
Useful gains	816.8984	922.4632	1017.8759	1050.5737	937.4695	678.0673	448.3652	470.1089	688.5502	799.3818	777.7113	777.6377	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1799.3382	1757.9115	1611.2655	1369.3649	1056.3707	704.6557	452.9773	477.8960	758.9903	1143.7045	1501.4972	1802.0448	(97)

Space heating kWh

730.9352	561.4213	441.4819	229.5297	88.4625	0.0000	0.0000	0.0000	0.0000	256.1761	521.1258	762.1589	(98a)

Space heating requirement - total per year (kWh/year) 3591.2913

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

730.9352	561.4213	441.4819	229.5297	88.4625	0.0000	0.0000	0.0000	0.0000	256.1761	521.1258	762.1589	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 3591.2913

Space heating per m2 (98c) / (4) = 26.8468 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 88.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	730.9352	561.4213	441.4819	229.5297	88.4625	0.0000	0.0000	0.0000	0.0000	256.1761	521.1258	762.1589	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	827.7861	635.8112	499.9795	259.9431	100.1840	0.0000	0.0000	0.0000	0.0000	290.1202	590.1765	863.1471	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0805	88.0561	87.9974	87.8787	87.6547	87.3000	87.3000	87.3000	87.3000	87.9024	88.0420	88.0895	(217)
Fuel for water heating, kWh/month	230.7012	203.3802	215.2185	187.9941	181.4984	162.9741	160.3261	167.6338	170.4392	190.1476	203.4444	228.0396	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.4618	-60.0609	-88.8559	-102.9269	-113.5609	-107.0227	-105.7369	-98.5479	-86.1799	-70.0244	-46.1543	-35.6548	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.3933	-41.4888	-84.0948	-128.8611	-172.7937	-174.5094	-172.0747	-144.1775	-103.9228	-59.7933	-26.0286	-15.2705	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 4067.1476 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 87.3000

Water heating fuel used 2301.7971 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)

mechanical ventilation fans (SFP = 0.1950) 81.9360 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 167.9360 (231)

Electricity for lighting (calculated in Appendix L) 242.3764 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -2098.5959 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (235)

Appendix Q - special features

Energy saved or generated -0.0000 (236)

Energy used 0.0000 (237)

Total delivered energy for all uses 4902.0593 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4067.1476	3.6400	148.0442	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.7971	3.6400	83.7854	(247)
Energy for instantaneous electric shower(s)	221.3981	16.4900	36.5085	(247a)
Pumps, fans and electric keep-hot	167.9360	16.4900	27.6927	(249)
Energy for lighting	242.3764	16.4900	39.9679	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	16.4900	-157.6753	
PV Unit electricity exported	-1142.4085	5.5900	-63.8606	
Total			-221.5359	(252)
Total energy cost			206.4627	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4158	(257)
SAP value		93.2604	
SAP rating (Section 12)		93	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4067.1476	0.2100	854.1010	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.7971	0.2100	483.3774	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1337.4784	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-956.1874	0.1340	-128.1068	
PV Unit electricity exported	-1142.4085	0.1254	-143.2342	
Total			-271.3409	(269)
Total CO2, kg/year			1155.2160	(272)
CO2 emissions per m2			8.6400	(273)
EI value			91.3409	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	47.2300 (1b)	x	2.4000 (2b)	=	113.3520	(1b) - (3b)
First floor	43.2700 (1c)	x	2.6700 (2c)	=	115.5309	(1c) - (3c)
Second floor	43.2700 (1d)	x	2.6700 (2d)	=	115.5309	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	133.7700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	344.4138	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.8200	(17)
Infiltration rate		0.1410	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1198	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1288	0.1228	0.1228	0.1139	0.1169	0.1019	0.1019	0.0989	0.1019	0.1139	0.1109	0.1198	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Front Door			2.1500	1.2000	2.5800			(26a)
Patio Door			5.8500	1.1450	6.6985			(27)
Window			16.2800	1.1450	18.6412			(27)

Ground FLoor			47.2300	0.1100	5.1953	110.0000	5195.3000 (28a)
Brickwork	145.9800	24.2800	121.7000	0.2500	30.4250	60.0000	7302.0005 (29a)
Cold Roof-500mm	32.2000		32.2000	0.0000	0.0000	9.0000	289.8000 (30)
Flat Roof	3.9100		3.9100	0.1300	0.5083	9.0000	35.1900 (30)
Sloping roof	10.2100		10.2100	0.1200	1.2252	9.0000	91.8900 (30)
Total net area of external elements Aum(A, m2)			207.3300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		65.2735		(33)
Main dwelling							
Party Wall 1			75.1900	0.0000	0.0000	45.0000	3383.5501 (32)
Internal Wall 1			76.6200			9.0000	689.5800 (32c)
Internal Wall 2			86.3900			9.0000	777.5100 (32c)
Internal Wall 3			70.0800			9.0000	630.7200 (32c)
Internal Floor 1			43.2700			18.0000	778.8600 (32d)
Internal Floor 2			43.2700			18.0000	778.8600 (32d)
Internal Ceiling 1			47.2300			9.0000	425.0700 (32e)
Internal Ceiling 2			43.2700			9.0000	389.4300 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20767.7606 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		155.2498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.9300	0.0500	0.5965
E3 Sill	8.3020	0.0170	0.1411
E4 Jamb	45.3100	0.0130	0.5890
E5 Ground floor (normal)	19.4400	0.0660	1.2830
E6 Intermediate floor within a dwelling	37.2200	0.0030	0.1117
E16 Corner (normal)	16.0000	0.0490	0.7840
E18 Party wall between dwellings	16.0000	0.0400	0.6400
P1 Party wall - Ground floor	9.9700	0.0580	0.5783
P2 Party wall - Intermediate floor within a dwelling	18.2800	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	9.9700	0.0360	0.3589
E11 Eaves (insulation at rafter level)	9.1300	0.0060	0.0548
E12 Gable (insulation at ceiling level)	7.1200	0.0400	0.2848
E15 Flat roof with parapet	6.4100	0.0890	0.5705
E13 Gable (insulation at rafter level)	2.3700	0.0390	0.0924

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.0850 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	71.3585 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	56.8283	(38)
Heat transfer coeff	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	128.1868	(39)
Average = Sum(39)m / 12 =												128.1868	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	0.9583	(40)
HLP (average)												0.9583	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9041 (42)
Hot water usage for mixer showers												
	48.6085	47.8780	46.8136	44.7769	43.2739	41.5977	40.6450	41.7014	42.8595	44.6591	46.7396	48.4223 (42a)
Hot water usage for baths												
	31.4781	31.0106	30.3523	29.1384	28.2295	27.2217	26.6773	27.3310	28.0428	29.1212	30.3601	31.3717 (42b)
Hot water usage for other uses												
	44.3714	42.7578	41.1443	39.5308	37.9173	36.3038	36.3038	37.9173	39.5308	41.1443	42.7578	44.3714 (42c)
Average daily hot water use (litres/day)												114.3382 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.4580	121.6465	118.3102	113.4462	109.4208	105.1233	103.6262	106.9498	110.4331	114.9247	119.8575	124.1653	(44)
Energy conte	197.1111	173.2230	181.8384	155.3022	147.3014	129.2613	125.3269	132.4262	136.1751	155.9518	170.7590	194.4129	(45)
Energy content (annual)										Total = Sum(45)m =		1899.0892	
Distribution loss (46)m = 0.15 x (45)m													
	29.5667	25.9835	27.2758	23.2953	22.0952	19.3892	18.7990	19.8639	20.4263	23.3928	25.6138	29.1619	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	27.4960	24.7957	27.3708	26.3184	27.0876	26.1048	26.9074	26.9656	26.1615	27.1585	26.4451	27.4739	(61)
Total heat required for water heating calculated for each month													
	224.6071	198.0187	209.2092	181.6205	174.3890	155.3662	152.2343	159.3918	162.3366	183.1103	197.2041	221.8868	(62)
WWHRS	-21.4042	-18.9301	-19.8225	-16.4138	-15.2971	-13.0898	-12.2696	-13.0475	-13.5432	-15.9660	-18.0875	-21.0079	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
										Total per year (kWh/year) = Sum(64)m =		2020.4955	(64)
Electric shower(s)	19.4637	17.3423	18.9371	18.0715	18.4106	17.5619	18.1473	18.4106	18.0715	18.9371	18.5810	19.4637	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		221.3981	(64a)
Heat gains from water heating, kWh/month	77.2794	68.1311	72.0382	62.7354	60.3523	53.8961	52.9349	55.3758	56.3365	63.3779	68.0339	76.3767	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	174.2487	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.3109	30.4746	24.7836	18.7628	14.0254	11.8408	12.7945	16.6307	22.3217	28.3425	33.0799	35.2645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	451.0587	455.7392	443.9443	418.8344	387.1376	357.3470	337.4451	332.7646	344.5595	369.6694	401.3662	431.1568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	55.3290	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	-116.1658	(71)

Water heating gains (Table 5)

	103.8701	101.3856	96.8256	87.1325	81.1186	74.8557	71.1490	74.4298	78.2451	85.1853	94.4915	102.6568 (72)

Total internal gains

	705.6516	704.0114	681.9655	641.1417	598.6935	557.4555	534.8005	537.2370	558.5382	599.6092	645.3496	685.4900 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	5.8500	23.8018	0.6300	0.7000	0.7700	42.5537	(80)
East	9.1200	23.8018	0.6300	0.7000	0.7700	66.3401	(76)
West	7.1600	23.8018	0.6300	0.7000	0.7700	52.0828	(80)

Solar gains	160.9765	275.0545	448.8805	662.9085	790.0921	854.9807	806.1651	710.9617	555.9502	350.1125	197.7213	133.1418	(83)
Total gains	866.6280	979.0659	1130.8460	1304.0502	1388.7856	1412.4362	1340.9656	1248.1987	1114.4884	949.7217	843.0709	818.6318	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	45.0032	
alpha	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	4.0002	
util living area	0.9810	0.9679	0.9297	0.8333	0.6707	0.4593	0.3133	0.3458	0.6326	0.8856	0.9665	0.9843	(86)
MIT	19.5693	19.7794	20.1667	20.5951	20.8714	20.9785	20.9965	20.9949	20.9228	20.5463	19.9745	19.5159	(87)
Th 2	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	20.1183	(88)
util rest of house	0.9770	0.9614	0.9155	0.8018	0.6158	0.3862	0.2307	0.2578	0.5574	0.8555	0.9584	0.9809	(89)
MIT 2	18.4518	18.7168	19.1989	19.7099	20.0100	20.1059	20.1172	20.1166	20.0644	19.6667	18.9664	18.3844	(90)
Living area fraction									fLA = Living area / (4) =			0.1973	(91)
MIT	18.6723	18.9264	19.3898	19.8845	20.1800	20.2780	20.2907	20.2899	20.2337	19.8402	19.1653	18.6076	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5223	18.7764	19.2398	19.7345	20.0300	20.1280	20.1407	20.1399	20.0837	19.6902	19.0153	18.4576	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9670	0.9481	0.8980	0.7862	0.6100	0.3871	0.2328	0.2599	0.5543	0.8380	0.9446	0.9720	(94)
Useful gains	838.0202	928.2201	1015.5239	1025.3062	847.1047	546.7023	312.1521	324.4632	617.7155	795.8494	796.3606	795.7410	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1720.5598	1676.2211	1517.7064	1260.6555	913.9669	554.7954	312.8631	325.5782	651.6670	1049.8790	1412.0152	1712.2664	(97)
Space heating kWh	656.6094	502.6567	373.6237	169.4515	49.7455	0.0000	0.0000	0.0000	0.0000	188.9980	443.2713	681.8950	(98a)
Space heating requirement - total per year (kWh/year)												3066.2511	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	656.6094	502.6567	373.6237	169.4515	49.7455	0.0000	0.0000	0.0000	0.0000	188.9980	443.2713	681.8950	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3066.2511	
Space heating per m2											(98c) / (4) =	22.9218	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	88.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	656.6094	502.6567	373.6237	169.4515	49.7455	0.0000	0.0000	0.0000	0.0000	188.9980	443.2713	681.8950	(98)
Space heating efficiency (main heating system 1)	88.3000	88.3000	88.3000	88.3000	88.3000	0.0000	0.0000	0.0000	0.0000	88.3000	88.3000	88.3000	(210)
Space heating fuel (main heating system)	743.6120	569.2601	423.1299	191.9043	56.3369	0.0000	0.0000	0.0000	0.0000	214.0408	502.0060	772.2480	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	203.2029	179.0886	189.3867	165.2067	159.0919	142.2764	139.9647	146.3443	148.7934	167.1443	179.1166	200.8790	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0616	88.0351	87.9611	87.8035	87.5361	87.3000	87.3000	87.3000	87.3000	87.8278	88.0099	88.0704	(217)
Fuel for water heating, kWh/month	230.7508	203.4286	215.3074	188.1551	181.7443	162.9741	160.3261	167.6338	170.4392	190.3090	203.5187	228.0890	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2631	12.8828	14.2631	13.8030	14.2631	13.8030	14.2631	14.2631	13.8030	14.2631	13.8030	14.2631	(231)
Lighting	30.0321	24.0929	21.6930	15.8932	12.2764	10.0299	11.1989	14.5568	18.9078	24.8081	28.0206	30.8668	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.7339	-61.9873	-91.0570	-106.1787	-115.2755	-111.6331	-109.7576	-103.8478	-91.4637	-75.6541	-52.2369	-41.3356	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-24.9225	-44.0591	-88.4624	-138.3922	-179.3881	-194.9470	-189.7286	-164.2186	-118.9921	-69.9171	-32.6846	-19.7997	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3472.5381	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2302.6762	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 7.2150, total flow = 37.0000, SFP = 0.1950)		
mechanical ventilation fans (SFP = 0.1950)	81.9360	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	167.9360	(231)
Electricity for lighting (calculated in Appendix L)	242.3764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2273.6732	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4133.2515	(238)

10a. Fuel costs - using BEDF prices (593)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3472.5381	7.3200	254.1898	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.6762	7.3200	168.5559	(247)
Energy for instantaneous electric shower(s)	221.3981	27.6700	61.2609	(247a)
Pumps, fans and electric keep-hot	167.9360	27.6700	46.4679	(249)
Energy for lighting	242.3764	27.6700	67.0655	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	27.6700	-278.9582	
PV Unit electricity exported	-1265.5121	5.8100	-73.5263	
Total			-352.4844	(252)
Total energy cost			353.0555	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3472.5381	0.2100	729.2330	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.6762	0.2100	483.5620	(264)
Energy for instantaneous electric shower(s)	221.3981	0.1391	30.8014	(264a)
Space and water heating			1212.7950	(265)
Pumps, fans and electric keep-hot	167.9360	0.1387	23.2948	(267)
Energy for lighting	242.3764	0.1443	34.9824	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	0.1342	-135.3132	
PV Unit electricity exported	-1265.5121	0.1253	-158.6057	
Total			-293.9190	(269)
Total CO2, kg/year			1007.9546	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3472.5381	1.1300	3923.9681	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.6762	1.1300	2602.0241	(278)
Energy for instantaneous electric shower(s)	221.3981	1.5143	335.2707	(278a)
Space and water heating			6525.9921	(279)
Pumps, fans and electric keep-hot	167.9360	1.5128	254.0537	(281)
Energy for lighting	242.3764	1.5338	371.7649	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1008.1611	1.4960	-1508.2213	
PV Unit electricity exported	-1265.5121	0.4599	-582.0632	
Total			-2090.2845	(283)
Total Primary energy kWh/year			5396.7969	(286)